# FALCOM

# A2D-3, A2D-3JP3, A3D & A3D-JP3

*User's Manual*

Version 1.08

## Contents

**Version history:**

| Version number | Author | Changes |
|---|---|---|
| 1.00 | S. Mohamad | Initial version |
| 1.01 | S. Mohamad | - Definition of Mute and Ignition lines added<br>- Change in example 14 |
| 1.02 | S. Mohamad | - Dimensions for Audio Interface (Interface G) of FALCOM A3D added<br>- Link to manufacturer of GPS receiver JP2 in FALCOM A3D added<br>- Definition of the limitation of IO's current of FALCOM A2D-3 and A2D-3JP3 added |
| 1.03 | S. Mohamad | - "**CAUTION"** section for the Audio interface added<br>- Definition of the load current at pin 10 of interface of FALCOM A3D added |
| 1.04 | S. Mohamad | - FALCOM A3D-JP3 added<br>- Supported GPS protocols added<br>- Used abbreviations extended<br>- Links added |
| 1.05 | S. Mohamad | - Direction and load current of the IO's explained<br>- Current consumption at discharged battery added |
| 1.06 | S. Mohamad | - Caution: maximim serial speed for firmware and monitor update added |
| 1.07 | S. Mohamad<br>F. Beqiri | - Maximum torque for SMA connector added.<br>- A complete update implemented.<br>- Power consumption of A3D and A3D-JP3 as well A2D-3 and A2D-3JP3 added. |
| 1.08 | F. Beqiri | - Throughout the manual of A3Dman, the misprints corrected (the max. value of input power supply on the A3D, A3D-JP3 devices corrected to 31.2 VDC instead of 36 VDC) |

# CAUTION

**Important notes for using FALCOM A2D-3, A2D-3JP3 and A3D.**

1. **Inserting or removing the SIM card from the SIM card holder takes place only at switched OFF modems.**
2. **Connecting an external device (e.g. handset) only at switched OFF modems**
3. **Use only 3V DC GPS-Antenna (active) for A2D-3JP3 and A3D.**
4. **Use only 5V DC GPS-Antenna (active) for A2D-3**
5. **Note the line colours of the power supply.**
6. **Do not connect the audio signals to Ground (GND) directly.**
7. **Do not connect external DC-Sources to the audio signals, otherwise the modem will be damaged.**
8. **Falcom recommends to use 57600 bps as a maximum speed for update the GSM firmware, GPS/Alarm firmware or the monitor software. In case of damage because of using a speed which exceeds 57600bps, no liability is accepted.**
9. **The recommended torque to screw the SMA connector into interface F (GPS connector) of A3D is 60 ...80 Ncm. Do not apply lengthwise force into the direction of the modem.**
10. **The integrated GPS receiver into the A3D-JP3-G10 and A2D-3JP3-G10 is a new version of Falcom JP3. For more details please download its corresponding manual "*hardware description*" from the Falcom's homepage "*www.falcom.de*".**

# 0 Introduction

This manual is focussed on the GSM data solutions of the FALCOM A3D, A3D-JP3 , A2D-3 and A2D-3JP3 series from FALCOM GmbH. It contains information about their GPS/Alarm firmware as well as their technical data. It does not contain special information about the GSM related accessories, as there are the Dial-Handset, the Hands-Free-Set and the mobile data terminals, which are also sold by FALCOM.

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The FALCOM A3D-JP3 concept (refer to figure below) combines 16 Bit CPU Core, Dual Band GSM Engine, 12 channel GPS Receiver and car voltage range power supply with an integrated 1200mAh Li-Ion Backup-Battery. It provides 2 external RS232, 1 RS485, 2 audio interfaces and 8 digital I/Os (or 6 digital I/Os and 2 analogue inputs). The 256KB RAM- and 1 MB Flash-Memory on board plus the integrated MMC Flash Card Reader allow the creation of a large variety of applications including extensive data-logging. An integrated power management co-processor allows different applications under low power conditions.

The principal hardware components is shown in the figure follow:

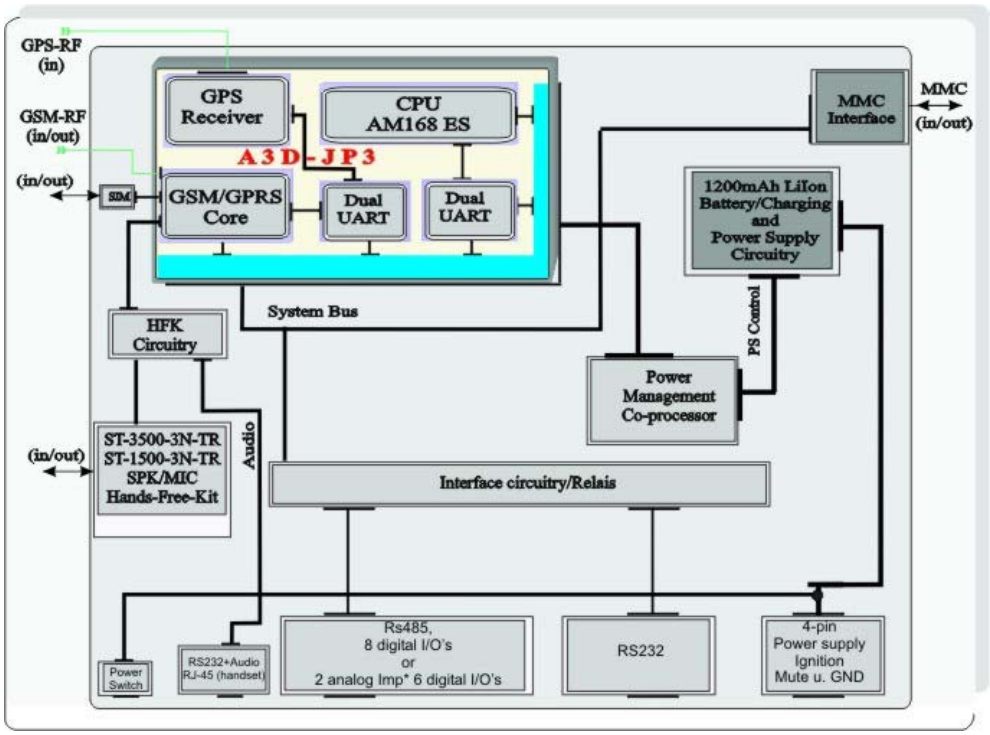



**Figure a:** Architecture of the A3D-JP3

## 0.1 Used abbreviations

| Abbreviation | Description |
|---|---|
| CCITT | Comité Consultatif International Télégraphique et Téléphonique |
| CTS | Clear To Send |
| DCD | Data Carrier Detect |
| DIN | Deutsche Industrienorm |
| DSR | Data Set Ready |
| DTR | Data Terminal Ready |
| ETSI | European Telecommunications Standards Institute |
| FAA | Federal Aviation Administration |
| FM | Frequency Modulation |
| GND | Ground |
| GPS | Global Positioning System |
| GSM | Global System for Mobile communications |
| HL | High-Low |
| IMEI | International Mobile station Equipment Identity |
| LED | Lighting Emitting Diode |
| LH | Low-High |
| MIC | Microphone |
| MMC | Multimedia Card |
| PIN | Personal Identification Number |
| PUK | Personal Unblocking Key |
| RF | Radio Frequency |
| RI | Ring Indicator |
| RTS | Request To Send |
| RxD | Receive Data |

| | |
|---|---|
| SIM | Subscriber Identity Module |
| SMS | Short Message Service |
| TxD | Transmit Data |

## 0.2 Related documents

- **ETSI GSM 07.05**: "Use of Data Terminal Equipment - Data Circuit terminating Equipment interface for Short Message Service and Cell Broadcast Service"
- **ETSI GSM 07.07**: "AT command set for GSM Mobile Equipment"
- **ITU-T V.25ter**: "Serial asynchronous automatic dialling and control"

The below related documents could be found on: www.falcom.de > **Service** > **Manuals**

- "**a2dman.pdf**"**:** AT command set
- "**progmanxx.pdf**"**:** Programming manual for Falcom A2D-3, Falcom A2D-3JP3, Falcom A3D and A3D-JP3
- **Zod_dg.pdf:** User manual for GPS protocols of the GPS receiver JP2
- **SiRFmessages.pdf:** Input/Output Messages for Falcom GPS-Receivers with SiRFstarIIe-chip-set
- **A2-3dev.zip:** Sources (examples) and libraries for programming FALCOM A2D-3, FALCOM A2D-3JP3, FALCOM A3D and FALCOM A3D-JP3 . It also includes a "getting started" document for the developer-KIT.

# 1 Safety

**IMPORTANT FOR THE EFFICIENT AND SAFE OPERATION OF YOUR GSM MODEM. READ THIS INFORMATION BEFORE USE !**

Your GSM modem is one of the most exciting and innovative electronic products ever developed. With it you can stay in contact with your office, your home, emergency services, and others, wherever service is provided.

## 1.1 GENERAL

Your modem utilises the GSM standard for cellular technology. GSM is a newer radio frequency (« RF ») technology than the current FM technology that has been used for radio communications for decades. The GSM standard has been established for use in the European community and elsewhere.
Your modem is actually a low power radio transmitter and receiver. It sends out and receives radio frequency energy. When you use your modem, the cellular system handling your calls controls both the radio frequency and the power level of your cellular modem.

## 1.2 EXPOSURE TO RF ENERGY

There has been some public concern about possible health effects of using GSM modem. Although research on health effects from RF energy has focused for many years on the current RF technology, scientists have begun research regarding newer radio technologies, such as GSM. After existing research had been reviewed, and after compliance to all applicable safety standards had been tested, it has been concluded that the product is fit for use.
If you are concerned about exposure to RF energy there are things you can do to minimise exposure. Obviously, limiting the duration of your calls will reduce your exposure to RF energy. In addition, you can reduce RF exposure by operating your cellular modem efficiently by following the below guidelines.

## 1.3 EFFICIENT MODEM OPERATION

For your modem to operate at the lowest power level, consistent with satisfactory call quality :
If your modem has an extendible antenna, extend it fully. Some models allow you to place a call with the antenna retracted. However your modem operates more efficiently with the antenna fully extended.
Do not hold the antenna when the modem is « IN USE ». Holding the antenna affects call quality and may cause the modem to operate at a higher power level than needed.

## 1.4 ANTENNA CARE AND REPLACEMENT

Do not use the modem with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Replace a damaged antenna immediately. Consult your manual to see if you may change the antenna yourself. If so, use only a manufacturer-approved antenna. Otherwise, have your antenna repaired by a qualified technician.
Use only the supplied or approved antenna. Unauthorised antennas, modifications or attachments could damage the modem and may contravene local RF emission regulations or invalidate type approval.

## 1.5 DRIVING

Check the laws and regulations on the use of cellular devices in the area where you drive. Always obey them. Also, when using your modem while driving, please : give full attention to driving, pull off the road and park before making or answering a call if driving conditions so require. When applications are prepared for mobile use they should fulfil road-safety instructions of the current law!

## 1.6 ELECTRONIC DEVICES

Most electronic equipments, for example in hospitals and motor vehicles are shielded from RF energy. However RF energy may affect some malfunctioning or improperly shielded electronic equipments.

## 1.7 VEHICLE ELECTRONIC EQUIPMENT

Check your vehicle manufacturer's representative to determine if any on board electronic equipment is adequately shielded from RF energy.

## 1.8 MEDICAL ELECTRONIC EQUIPMENT

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc...) to determine if they are adequately shielded from external RF energy.
Turn your modem **OFF** in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

## 1.9 AIRCRAFT

Turn your modem **OFF** before boarding any aircraft.
Use it on the ground only with crew permission.
Do not use in the air.
To prevent possible interference with aircraft systems, **F**ederal **A**viation **A**dministration (FAA) regulations require you to have permission from a crew member to use your modem while the plane is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your modem whilst airborne.

## 1.10 CHILDREN

Do not allow children to play with your modem. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children could damage the modem, or make calls that increase your modem bills.

## 1.11 BLASTING AREAS

To avoid interfering with blasting operations, turn your unit **OFF** when in a « blasting area » or in areas posted : «turn off two-way radio». Construction crew often use remote control RF devices to set off explosives.

## 1.12 POTENTIALLY EXPLOSIVE ATMOSPHERES

Turn your modem **OFF** when in any area with a potentially explosive atmosphere. It is rare, but your modem or its accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.
Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas such as petrol stations ; below decks on boats ; fuel or chemical transfer or storage facilities ; and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.
Do not transport or store flammable gas, liquid, or explosives, in the compartment of your vehicle which contains your modem or accessories.
Before using your modem in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.

## 1.13 NON-IONISING RADIATION

As with other mobile radio transmitting equipments, users are advised that for satisfactory operation and for the safety of personnel, it is recommended that no part of the human body be allowed to come too close to the antenna during operation of the equipment.
The radio equipment shall be connected to the antenna via a non-radiating 50 Ohm coaxial cable.
The antenna shall be mounted in such a position that no part of the human body will normally rest close to any part of the antenna. It is also recommended to use the equipment not close to medical devices as for example hearing aids and pacemakers.

# 2 SAFETY STANDARDS

**THIS CELLULAR MODEM COMPLIES WITH ALL APPLICABLE RF SAFETY STANDARDS.**

This cellular modem meets the standards and recommendations for the protection of public exposure to RF electromagnetic energy established by governmental bodies and other qualified organizations, such as the following :

- Directives of the European Community, Directorate General V in Matters of Radio Frequency Electromagnetic Energy.

# 3 FALCOM A3D & A3D-JP3

## 3.1 General description

The GSM modem (**G**lobal **S**ystem for **M**obile communications) FALCOM A3D or FALCOM A3D-JP3 with the firmware GPS/ALARM is a mobile station for the transmission of voice, data calls as well as SMS (**S**hort **M**essage **S**ervice) in GSM networks. It also includes GPS functions (**G**lobal **P**ositioning **S**ystem) for position determination.
The GSM modems FALCOM A3D and FALCOM A3D-JP3 can contain the following components:

| Feature | A3D | A3D-JP3 |
|---|---|---|
| GSM/GPRS Core | WM2D | WM2D |
| GPS Core (option) | none | JP3[2)] |
| CPU Core | AM186ES | AM186ES |
| Flash/ SRAM/ EEPROM/ RTC | 1MB/ 256KB/ 4KB/Yes | 1MB/ 256KB/ 4KB/Yes |
| MMC Card support (option) | Yes | Yes |
| External Serial Interfaces | 3 RS232/ 1RS485 | 3 RS232/ 1RS485 |
| IO's | 8 digital IO's or<br>6 digital IO's + 2 analogue inputs | 8 digital IO's or<br>6 digital IO's + 2 analogue inputs |
| Hands-Free-Kit (option) | Integrated (Full Duplex, Echo-Cancellation) | Integrated (Full Duplex, Echo-Cancellation) |
| Backup Battery | 1200mAh Li-Ion + | 1200mAh Li-Ion + |
| Communication via Internet (option) | Yes (GPRS Class 10, Class B) | Yes (GPRS Class 10, Class B) |
| Power Management | Enhanced (Co-Processor) | Enhanced (Co-Processor) |
| Voltage Range | 8 - 31.2 V DC | 8 - 31.2 V DC |
| Cradle | Yes (same like A2D-3) | Yes (same like A2D-3) |
| DOS like Monitor | Yes | Yes |

**Table 1:** The difference between the A3D and A3D-JP3 as far as the containing components is concerned.

**2) FALCOM JP3: Chipset SiRF starII Low Power (new version)**

If the GSM modem FALCOM A3D or FALCOM A3D-JP3 is registered in the network, it acts just like a regular data modem. To control the GSM modem there is an advanced set of AT commands according to GSM ETSI 07.07 and 07.05 implemented.

### 3.1.1 Functional overview

Included into the GSM modems FALCOM A3D and FALCOM A3D-JP3 there are interfaces for the power supply, for the GSM and GPS antennas (A3D-JP3 with an internal GPS receiver), for the voice equipment and a SIM card holder as well as LED's for displaying the working state of the modem. A detailed description of the connector signals you can find in the corresponding chapter "Technical Data".

### 3.1.2 SIM card

The GSM modems FALCOM A3D and FALCOM A3D-JP3 use a SIM card (3V only) with an activated or deactivated PIN (Personal Identification Number). This SIM card fits into the SIM card holder.

**CAUTION:** Before you insert or remove the SIM card from the SIM card holder it is recommended to switch off the modem. Otherwise, the SIM card could be damaged.

### 3.1.3 Serial interfaces

The serial interfaces of the GSM modem FALCOM A3D and FALCOM A3D-JP3 are used for control and for data/voice transmission.

| | |
|---|---|
| Connectors | 15-pin D-Sub (female). |
| | 9-pin D-Sub (female) to DIN 41652. |
| | 8-pin RJ45. |
| Logic | V.24 asynchronous |
| Baud rate | 9600 Baud (programmable 1200..115.200 Baud) |
| Character format | 8 data bits |
| Parity | None |
| Stop bits | 1 |
| Signal levels | CCITT Recommendation V.28 |

**Table 2:** The available connectors for serial interfaces on the A3D and A3D-JP3.

#### *3.1.3.1 Determining the External Equipment Type*

Before you connect the DB9 serial port connectors on the aforementioned terminals (DCE units) to external equipment, you need to determine if the external hardware serial ports are configured as DTE or DCE.
The terms DTE (Data Terminal Equipment) and DCE (Data Communications Equipment) are typically used to describe serial ports on devices. Computers (PCs) generally use DTE connectors and communication devices such as modems and DSU/CSU devices generally use DCE connectors. As a general rule, DTE ports connect to DCE ports via straight through pinned cables. In other words, a DTE port never connects directly to another DTE port. Similarly, a DCE port never connects directly to another DCE port. The signaling definitions were written from the perspective of the DTE device; therefore, a Receive Data signal becomes an input to DTE but an output from DCE.

The A3D and A3D-JP3 as well A2D-3 and A2D-3-JP3 are designed for use as a DCE. Based on the aforementioned conventions for DCE-DTE connections it communicates with the customer application (DTE) using the following signals:

| GSM Terminal (DCE) | to | Application (DTE) |
|---|---|---|
| TxD | ◄---------- | TXD |
| RxD | ----------► | RXD |
| RTS | ◄---------- | RTS |
| CTS | ----------► | CTS |
| DTR | ◄---------- | DTR |
| DSR | ----------► | DSR |
| DCD | ----------► | DCD |
| RING | ----------► | RING |

**Table 3:** The signaling definitions between DTE and DCE.

### 3.1.4 Multimedia Card (MMC)

With the MMC the user can record music, images and voice data which have been received via FALCOM A3D or A3D-JP3 . There are different MMCs with different storage capacities which are available on the market. These different MMCs are compatible with FALCOM A3D and A3D-JP3.

**Note:** The FALCOM GPS/Alarm firmware does not support the MMC card. The user (programmer) must support it by programming his own firmware.

### 3.1.5 LED's for working state of FALCOM A3D and A3D-JP3

The actual state of the FALCOM A3D and A3D-JP3 is displayed by two LED's at the connector on the interface D of unit.

- **Green and orange light:** Power on, not registered in the network
- **Green flashes, orange lights:** Power on, registered in the network
- **Green and orange flash slowly and alternately:** In Monitor
- **Green and orange flash quickly and alternately:** Firmware download in progress
- **Green flashes quickly and orange lights:** Call in progress

### 3.1.6 Operating by internal Battery

The following components are supplied at breakdown of the external power supply:

- Internal GPS-Receiver (only by A3D-JP3)
- GSM-Engine (audio functionality only with headset)

**Note: The IO's, the internal Hands-Free-Unit and Handset does not work when the modem is supplied by the internal battery, only.**

## 3.2 Functional description

The GSM modules of the FALCOM A3D and A3D-JP3 are controlled by an advanced set of AT-Commands. In this manual you can find a short overview of these commands. For further information we suggest to read the **ETSI GSM** recommendation or have a look at the "**AT commands interface guide_xx**" which can be downloaded from the homepage of FALCOM **www.falcom.de** > **SERVICE > Manuals** > **AT commands interface guide_xx**.
The controller in the FALCOM A3D and FALCOM A3D-JP3 can handle the Interfaces **"B"**, **"C"** and **"D"** for user inputs. These interfaces use standard parameters, that means **9600 Baud**, **8-bit** characters, **no parity** and **1 stop bit**. By using the Interface **"B"** an application on a terminal equipment is able to acquire the GSM module and to configure the special functions of the FALCOM A3D and FALCOM A3D-JP3. For a full functionality of the FALCOM A3D or FALCOM A3D-JP3 a valid SIM card must be inserted. After initialisation and registration into the network, the modem via LED's (indicators), which are available on the bottom side of interface "**D**" (RJ45 connector) shows the actual registration state. Configuration of the modem can be done by using a local interface connection. It can also be done by a remote connection from another modem via data call or SMS transmission. You can also find in this manual commands to control and configure the unit.

# 4 Technical data for FALCOM A3D and FALCOM A3D-JP3

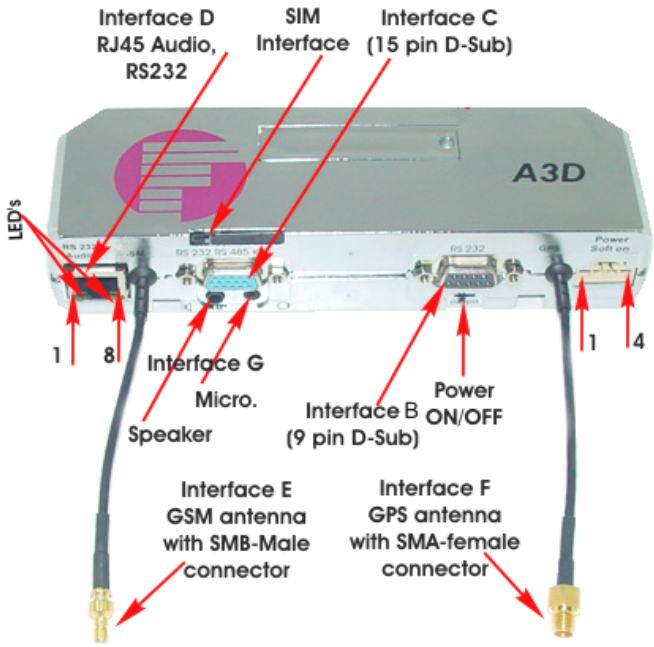



**Figure 1:** Interfaces of A3D-JP3

| General specification | |
|---|---|
| Dimensions | 168mm x 61mm x 32mm ( L x W x H ) |
| Weight | ✓ Approx. 220 g (A3D)<br>✓ Approx. 250 g (A3D-JP3 ) |

**Table 4:** General specifications.

## 4.1 Power consumption

### 4.1.1 A3D-900/1800-G10 power consumption

| Power consumption | | | | |
|---|---|---|---|---|
| Power supply | ♦ 8...31.2 V DC<br>♦ 3,6 V; 1200 mAh Li-Ion Backup Battery<br>♦ max. 4h Backup-Time (20°C)<br>♦ min. 3h Charging-Time | | | |
| Average current consumption at +12 V DC | | | | |
| GSM | 900 | 1800 | MHz | GSM band |
| | 105 | 100 | mA | in idle mode (base station sends at -85 dBm) |

| | | | | |
|---|---|---|---|---|
| | 240 | 180 | mA | in transmit mode at power level 7/3 |
| | | 195 | mA | in transmit mode at power level 5/0 (maximum) |

**Table 5:** A3D power consumption at 12 V DC.

### 4.1.2 A3D-JP3-900/1800-G10 power consumption

| Power consumption | | | | |
|---|---|---|---|---|
| Power supply | ♦ 8...31.2 V DC<br>♦ 3,6 V; 1200 mAh Li-Ion Backup Battery<br>♦ max. 4h Backup-Time (20°C)<br>♦ min. 3h Charging-Time | | | |
| Average current consumption at +12 V DC | | | | |
| GPS ON/GSM OFF | VC3 3.3 V DC ± 5 % | | | |
| | Max. 65 mA continuous mode | | | |
| GPS OFF /GSM ON | 900 | 1800 | MHz | GSM band |
| | 123 | 123 | mA | in idle mode (base station sends at -85 dBm) |
| | 211 | 190 | mA | in transmit mode at power level 7/3 |
| | 231 | 211 | mA | in transmit mode at power level 5/0 (maximum) |

**Table 6:** A3D-JP3 power consumption at 12 V DC.

**Note:** The given current consumption is for a full charged battery. In case of discharged battery the current consumption is about 800 mA.

| Temperature limits | |
|---|---|
| Storage | -20°C to +70°C |
| Operating with DC | -20°C to +55°C |
| Operating with battery | 0°C to +45°C |

# 5 GSM Core (A3D and A3D-JP3)

## 5.1 General

- Dual Band GSM/GPRS modem E-GSM 900/1800 MHz
- Class 4 (2W at 850/900 MHz)
- Class 1 (1W at 1800/1900 MHz)
- Small size and low power consumption
- Voice, SMS
- Fax and data transmission without extra hardware
- Tricodec (FR/EFR/HR)
- Internal 3V SIM interface
- Easy remote control by AT commands for dedicated applications
- Fully Type Approved according to GSM Phase 2+ specifications
- Fully shielded and ready-to-use

## 5.2 Electrical

| | |
|---|---|
| Power supply: | +8 ... +31.2 V DC (absolute maximum ratings) suitable for direct connection to an automotive +12V or +24V DC supply |

## 5.3 Physical

| | |
|---|---|
| Casing: | Complete shielding, aluminium (colour metallic with surface structure) |

## 5.4 Basic Features

### 5.4.1 Telephony

- Telephony (TCH/FS) & Emergency calls
- Full Rate, Enhanced Full Rate and Half Rate
- Dual Tone Multi Frequency function (DTMF)

### 5.4.2 Short Message Service (GSM and GPRS mode)

- Text and PDU
- Point to point MT & MO
- SMS Cell Broadcast

### 5.4.3 GSM circuit Data Features

- Data circuit asynchronous, transparent and non transparent up to 14,400 bits/s
- Automatic fax group 3 (Class 1 & 2)
- Alternate speech and fax
- MNP2, V.42bis

### 5.4.4 GPRS Packet Data Features

- GPRS Class B Class 10 (max. 85.6 kbps, downstream)
- Coding Schemes: CS1 to CS4
- Compliant with SMG31bis

### 5.4.5 GSM Supplementary services

- Call Forwarding
- Call Barring
- Multiparty
- Call Waiting and Call Hold
- Calling Line Identity
- Advice of Charge
- USSD
- Closed User Group
- Explicit Call Transfer

### 5.4.6 Other features

- ME+SIM phone book management
- Fixed Dialling Number
- SIM Toolkit Class 2
- SIM, network and service provider locks
- Real Time Clock
- UCS2 character set management

# 6 GPS core (A3D-JP3)

## 6.1 General

The add-on module, the GPS unit, is integrated into the A3D-JP3. This highly integrated GPS receiver module is optimized specifically for automotive applications. The GPS receiver tracks the GPS constellation of satellites. The satellite signals received by an active antenna are tracked with 12 parallel channels of L1, C/A code and then down-converted to an IF frequency and digitally processed to obtain a full navigation solution of position, velocity, time and heading. The solution can be sent directly over GSM network.

## 6.2 Technical data

**FEATURES**

- Integrated 12 parallel channel GPS
- The GPS antenna interface will be internal supplied with **(2.85 V DC)**
- Protocols message: SiRF binary and NMEA-0183, version 2.20 with a baud rate selection
  SiRF binary – position, velocity, altitude, status and control NMEA – CGA, GLL, GSA, GSV, RMC and VTG
- DGPS protocol: RTCM SC-104, version 2.00, type 1, 5 and 9

### 6.2.1 NMEA data message

The integrated GPS receiver inside the A3D-JP3 delivers data in the NMEA-0183 format.

**Note:** The FALCOM GPS/Alarm firmware and its libraries support the protocols of the GPS receivers JP3.

For further information about the programming and developing a firmware from the user side, it is recommended to read the programming manual "progmanxx.pdf" which is available on Falcom's website: www.falcom.de > **Service** > **Manuals** > **progmanxx.pdf**. It is also recommended to download the zip file which includes the sources (examples) and the libraries for programming A3D-JP3. It also includes a "getting started" document for the developer-KIT.

Table below lists each of the NMEA output messages supported by the A3D-JP3 evaluation receiver and a brief description. For further description about NMEA see Related documents. It can also be switched to the SiRF binary mode.

#### *6.2.1.1 NMEA output messages*

The table below shows each of the NMEA output messages supported by the SiRFstarIIe Evaluation Receiver and a brief description.

| Option | Description |
|---|---|
| GGA | Time, position and fix type data. |
| GLL | Latitude, longitude, UTC time of position fix and status. |
| GSA | GPS receiver operating mode, satellites used in the position solution and DOP values. |
| GSV | The number of GPS satellites in view satellite ID numbers, elevation, azimuth and SNR values. |
| RMC | Time, date, position, course and speed data. |
| VTG | Course and speed information relative to the ground. |

**Table 7:** NMEA output messages.

#### *6.2.1.2 NMEA input messages*

The table below shows each of the NMEA input messages.

| Message | MID[1] | Description |
|---|---|---|
| SetSerialPort | 100 | Set PORT A parameters and protocol |
| NavigationInitialization | 101 | Parameters required for start using X/Y/Z[2] |
| SetDGPSPort | 102 | Set PORT B parameters for DGPS input |
| Query/Rate Control | 103 | Query standard NMEA message and/or set output rate |
| LLANavigation-Initialization | 104 | Parameters required for start using Lat/Lon/Alt[3] |
| Development Data On/Off | 105 | Development Data messages On/Off |
| MSK Receiver Interface | MSK | Command message to a MSK radio-beacon receiver. |

**Table 8:** NMEA input messages.

1) **Message Identification (MID).**
2) **Input co-ordinates must be WGS84.**
3) **Input co-ordinates must be WGS84.**

**Note:** NMEA input messages 100 to 105 are SiRF proprietary NMEA messages. The MSK NMEA string is as defined by the NMEA 0183 standard.

♦ ***Transport Message***

| Start Sequence | Payload | Checksum | End Sequence |
|---|---|---|---|
| $PSRF<MID>[1] | Data[2] | *CKSUM[3] | <CR> <LF>[4] |

[1] **Message Identifier consisting of three numeric characters. Input messages begin at MID 100.**

[2] **Message specific data. Refer to a specific message section for <data>...<data>definition.**

[3] **CKSUM is a two-hex character checksum as defined in the NMEA specification. Use of checksums is required on all input messages.**

[4] **Each message is terminated using Carriage Return (CR) Line Feed (LF) which is \r\n which is hex 0D 0A. Because \r\n is not printable ASCII characters, they are omitted from the example strings, but must be sent to terminate the message and cause the receiver to process that input message.**

**Note:** All fields in all proprietary NMEA messages are required, none are optional. All NMEA messages are comma delimited.

# 7 Interfaces of FALCOM A3D and FALCOM A3D-JP3

### 7.1.1 Interface (A)

The figure below shows the cable which is used for power supply connection (included in the package) to the aforementioned A3D series.

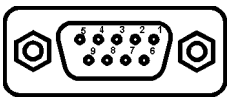
| Power input: +8 ... 31.2 V DC | | |
|---|---|---|
| **Pin number** | **Name** | **Functions** |
| 1 | GND (brown) | DC power negative input |
| 2 | Mute (green) | Do not connect |
| 3 | Ignition (yellow) | Ignition (connected to positive DC power) |
| 4 | Power supply (white) | DC power positive input |

**Table 9:** Pin-out of interface A.

The **Ignition** line is to switch the modem ON and OFF, especially in the motor vehicle. It must be connected to the positive pole (power supply).

### 7.1.2 Interface (B)

RS232/V24, 9 pin Sub-D (female) to DIN 41652



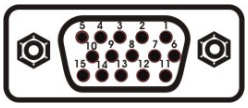
| Pin | Description | Direction |
|---|---|---|
| 1 | DCD ↔ Data Carrier Detect | OUT |
| 2 | RxD↔ Received Data | OUT |
| 3 | TxD ↔ Transmitted Data | IN |
| 4 | DTR ↔ Data Terminal Ready | IN |
| 5 | GND ↔ Signal Ground | - |
| 6 | DSR ↔ Data Set Ready | OUT |

| | | |
|---|---|---|
| 7 | RTS ↔ Request To Send | IN |
| 8 | CTS ↔ Clear To Send | OUT |
| 9 | RI ↔ Ring Indicator<br>optional 8... 31.2V DC or 5,0 V | OUT |

**Table 10:** Pin-out of interface B.

### 7.1.3 Interface C

RS232, RS485, IO's, 15 pin Sub-D female



| PIN | NAME | DISCRIPTION | LEVEL |
|---|---|---|---|
| 1 | IO1 | input* | |
| 2 | IO2 | input* | |
| 3 | IO3 | input* | |
| 4 | IO4 | output* | |
| 5 | IO5 | Not used* | |
| 6 | IO6 | Not used* | |
| 7 | IO7 | Not used* | |
| 8 | IO8 | Not used* | |
| 9 | OUT_K1 | output supply voltage for IO-signals | 8...31.2V DC (max. 1 A) |
| 10 | OUT_K2 | output | Output 5V DC/ 100mA max. |
| 11 | TxD232 | Transmit serial data | Input |
| 12 | RxD232 | Receive serial data | Output |
| 13 | TxD485 | Input | Input |
| 14 | RxD485 | Output | Output |
| 15 | GND | Ground | - |
| * **The directions of the IO's refer to the FW GPS/Alarm of FALCOM. They could be configured by the user (see programming manual progmanxx.pdf).** | | | |

**Table 11:** Pin-out of interface C.

**Caution:** **Please connect the IO's 1-8 to supply voltage through a resistor (1 kOhm to 100 kOhm) for input current limiting during power-on.**

**Note:** **The IO's does not work when the modem is supplied by the internal battery.**

### *7.1.3.1 Electrical parameter of general IO ports*

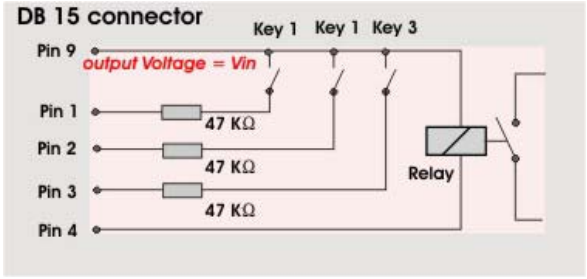
| Characteristics | Symbol | Limits | Unit |
|---|---|---|---|
| Output current per channal [1)] | $I_{out\ max}$ | 200 | mA |
| Output voltage | $V_{out}$ | <= 31.2 | V |
| Input resistance | $R_{in}$ | 470 | KΩ |
| Input voltage Logic High | $V_{inH}$ | > = 4.5 | V |
| Input voltage Logic Low [2)] | $V_{inL}$ | < =1.2 | V |
| Inputs-Outputs current limit [3)] | $I_{IO's\ max}$ | 1 | A |

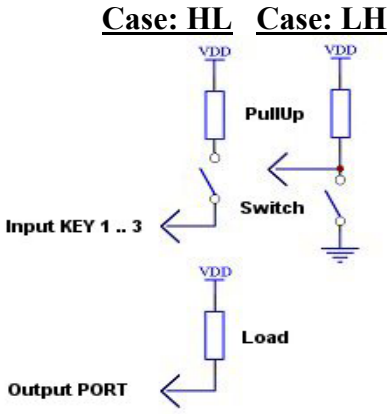
1) **The allowed maximum load current at the digital output (Pin14) is 200mA.**
2) **Or can be left open.**
3) **The allowed maximum load current by using all channels (IO's) together is 1 A (max.)**

**Table 12:** Electrical parameter of I/O ports .

The minimal value of load resistance can be calculated as below ***:

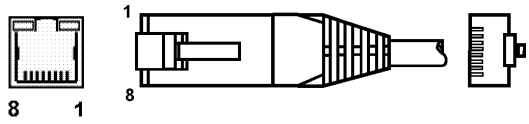
$$*** \ R_{min} = \frac{U_{Pin\ 9}}{0{,}2\ A}$$






### 7.1.4 Interface D

The figure below shows the RJ45-male and female connector, 8 pin shielded for audio and RS232.




| Pin | Description | Direction |
|---|---|---|
| 1 | **optional** output supply voltage for IO-signals 8...31.2 V DC or 5.0 V DC | OUT |
| 2 | TxD (Transmitted Data) | IN |
| 3 | RxD (Received Data) | OUT |
| 4 | Ground | - |
| 5 | SPK+ | OUT |
| 6 | SPK- | OUT |
| 7 | MIC+ | IN |
| 8 | MIC- | IN |
| **CAUTION:** | **Do not connect external DC-sources to the audio interface (RJ45), otherwise the modem will be damaged.** | |

**Table 13:** Pin-out of interface D .

The LED's at the bottom side of this interface are for the following indication:

**LED yellow:** Power
**LED green:** Status

**(see also the corresponding chapter for LED's for working state of FALCOM A3D and FALCOM A3D-JP3 )**

### 7.1.5 Interface E

GSM antenna, 50 Ohm SMB female

### 7.1.6 Interface F

GPS antenna, 50 Ohm SMA female

| | |
|---|---|
| GPS antenna description: | GPS antenna with LNA (low noise amplifier) |
| Frequency range: | 1575.42 +/- 1.023 MHz |
| LNA gain: | > = 25 dB |
| Power requirements: | 3V +/- 0,5V max. 50 mA |
| Maximum torque | 60...80 Ncm |

### 7.1.7 SIM interface

SIM card holder for small SIM cards (3V only)

### 7.1.8 Audio interface G

Electret-Microphone; Loudspeaker >4 Ohm
Speaker-Interface=3,5mm;
Microphone-Interface=2,5mm

# 8 FALCOM A2D-3 & A2D-3JP3

## 8.1 General description

The GSM modems FALCOM A2D-3 and A2D-3JP3 with the firmware GPS/ALARM are mobile stations for the transmission of voice and data calls as well as SMS in GSM networks. They also include GPS functions for position determination.

The GSM modem FALCOM A2D-3 and A2D-3(GPD)JP3 can contain the following components:

| Feature | A2D-3 | A2D-3JP3 |
|---|---|---|
| GSM Core | WM2C | WM2C2 |
| GPS Core (option) | **none** | **JP3**[3)] |
| CPU Core | AM186ES | AM186ES |
| Flash/SRAM/EEPROM/RTC | IMB/256KB/4KB/Yes | IMB/256KB/4KB/Yes |
| External Serial Interfaces | 2 RS232 | 2 RS232 |
| IO's | 4 digital IO's | 4 digital IO's |
| Power Management | Enhanced (Co-Processor) | Enhanced (Co-Processor) |
| Voltage Range | 10.8...31.2 VDC | 10.8...31.2 VDC |
| Cradle | Yes | Yes |
| DOS like Monitor | Yes | Yes |

**Table 14:** The difference between A2D and A2D-JP3 as well as the containing components is concerned.

[3)] **JP3: Chipset SiRF starII (For further information about the GPS protocols, please refer to the related document „SiRFmessages.pdf")**

If the GSM modem FALCOM A2D-3 or A2D-3JP3 is registered in the network, it acts just like a regular data modem. To control the GSM modem there is an advanced set of AT commands according to GSM ETSI 07.07 and 07.05 implemented. A protocol for controlling the data unit is available after establishing a call to the module or via short messages.

### 8.1.1 Functional overview

Included into the GSM modems FALCOM A2D-3 and A2D-3JP3 there are interfaces for the power supply, for the GSM and GPS antenna (for internal GPS receiver), for the voice equipment and a SIM card holder as well as a

LED's for displaying the working state of the modems. A detailed description of the connector signals you can find in corresponding chapter "**Technical Data**".

### 8.1.2 SIM card

The GSM modems FALCOM A2D-3 and A2D-3JP3 use a SIM card (3V only) with an activated or deactivated PIN. This SIM card fits into the SIM card holder under the plastic cover at the bottom of the module. By turning the metal flap of the SIM card holder to "OPEN", one can insert the SIM card in and close it by turning the metal flap to "CLOSE". Do not forget to close the plastic cover.

CAUTION: Before you insert or remove the SIM card from the SIM card holder it is recommended to switch off the modem. Otherwise, the SIM card could be damaged.

### 8.1.3 Serial interface

The serial interfaces of the GSM modems FALCOM A2D-3 and A2D-3JP3 are used for control and for data/voice transmission.

| | |
|---|---|
| Connector | 15-pin SubD (female) acc. DIN 41652 |
| | 8-pin RJ45 |
| Connector signals | Refer to the corresponding chapter "Technical data“ |
| Logic | V.24 asynchronous |
| Baud rate | 9600 Baud ( programmable 1200..115.200 Baud ) |
| Character format | 8 data bits |
| Parity | None |
| Stop bits | 1 |
| Signal levels | CCITT Recommendation V.28 |

**Table 15:** The serial interfaces of the A2D-3 and A2D-3-JP3 GSM modems.

### 8.1.4 LED's for functional display

The actual state of the FALCOM A2D-3 and A2D-3JP3 is displayed by two of LED's at the connector on the interface "**C"** of the unit.

- **Green and orange light:** Power on, not registered in the network
- **Green flashes, orange lights:** Power on, registered in the network
- **Green and orange flash slowly and alternately:** In Monitor
- **Green and orange flash quickly and alternately:** Firmware download in progress
- **Green flashes quickly and orange lights:** Call in progress

## 8.2 Functional description

The GSM module of the FALCOM A2D-3 and A2D-3JP3 is controlled by an advanced set of AT-Commands. In this document you can find a short overview of these commands. For further information it is recommended to read the ETSI GSM recommendation or have a look at the "**AT commands interface guide_xx"** which could be downloaded from the homepage of FALCOM www.falcom.de > **SERVICE** > **Manuals** > > **AT commands interface guide_xx** The controller in the FALCOM A2D-3 and A2D-3JP3 can handle the Interfaces **"B"** and **"C"** for user inputs. These interfaces use standard parameters, that means **9600 Baud**, **8-bit** characters, **no parity** and **1 stop bit**. By using the Interface **"B"** an application on a terminal equipment is able to acquire the GSM unit and to configure the special functions of the FALCOM A2D-3 and FALCOM A2D-3JP3. For a full functionality of the modems a valid SIM card must be inserted. After initialisation and registration into the network the modem shows the actual registration state. Configuration of the modem can be done by using a local interface connection. It can also be done by a remote connection from another modem via data call or SMS transmission. In this manual you can also find commands to control and configure the unit.

## 8.3 Technical data for FALCOM A2D and FALCOM A2D-JP3

### 8.3.1 A2D-3

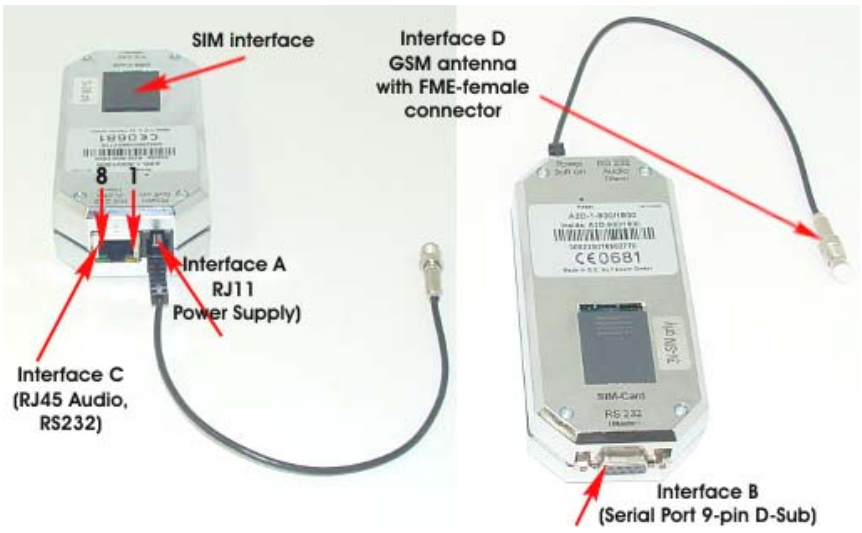



**Figure1:** Interfaces of FALCOM A2D-3

| General specification | |
|---|---|
| Dimensions | 115mm x 54mm x 33mm ( B x W x H ) |
| Weight | Approx. 200 g |

**Table 16:** General specification .

## 8.4 Power consumption

### 8.4.1 A2D-3-900/1800-G10 power consumption

| Power consumption | | | | |
|---|---|---|---|---|
| Power supply | +10.8...31.2 V DC | | | |
| Average current consumption at +12 V DC | | | | |
| GPS OFF /GSM ON | 900 | 1800 | MHz | GSM band |
| | 34 | 34 | mA | in idle mode (base station sends at -85 dBm) |
| | 127 | 108 | mA | in transmit mode at power level 7/3 |
| | 159 | 141 | mA | in transmit mode at power level 5/0 (maximum) |
| | Serial interface is applied and working. | | | |

**Table 17:** Power consumption of A2D-3.

| Temperature limits | |
|---|---|
| Storage | -25°C to +70°C |
| Operating | -20°C to +55°C |

# 9 GSM Core (A2D-3 and A2D-3JP3)

## 9.1 General

- Dual Band GSM/GPRS modem E-GSM 900/1800 MHz
- Class 4 (2W at 850/900 MHz)
- Class 1 (1W at 1800/1900 MHz)
- Small size and low power consumption
- Voice, SMS
- Fax and data transmission without extra hardware
- Tricodec (FR/EFR/HR)
- Internal 3V SIM interface
- Easy remote control by AT commands for dedicated applications
- Fully Type Approved according to GSM Phase 2+ specifications
- Fully shielded and ready-to-use

## 9.2 Electrical

| | |
|---|---|
| Power supply: | +10,8 to +31,2 V DC (absolute maximum ratings) suitable for direct connection to an automotive +12V or +24V DC supply |

## 9.3 Physical

| | |
|---|---|
| Casing: | Complete shielding, aluminium (colour black with surface structure) |

## 9.4 Basic Features

### 9.4.1 Telephony

- Telephony (TCH/FS) & Emergency calls
- Full Rate, Enhanced Full Rate and Half Rate
- Dual Tone Multi Frequency function (DTMF)

### 9.4.2 Short Message Service (GSM and GPRS mode)

- Text and PDU
- Point to point MT & MO
- SMS Cell Broadcast

### 9.4.3 GSM circuit Data Features

- Data circuit asynchronous, transparent and non transparent up to 14,400 bits/s
- Automatic fax group 3 (Class 1 & 2)
- Alternate speech and fax
- MNP2, V.42bis

### 9.4.4 GPRS Packet Data Features

- GPRS Class B Class 10 (max. 85.6 kbps, downstream)
- Coding Schemes: CS1 to CS4
- Compliant with SMG31bis

### 9.4.5 GSM Supplementary services

- Call Forwarding
- Call Barring
- Multiparty
- Call Waiting and Call Hold
- Calling Line Identity
- Advice of Charge
- USSD
- Closed User Group
- Explicit Call Transfer

### 9.4.6 Other features

- ME+SIM phone book management
- Fixed Dialling Number
- SIM Toolkit Class 2
- SIM, network and service provider locks
- Real Time Clock
- Software upgrade through X-modem protocol
- UCS2 character set management

# 10 GPS core (A2D-3JP3)

## 10.1 General

The add-on module, the GPS unit, is integrated into the A2D-3JP3. This highly integrated GPS receiver module is optimized specifically for automotive applications. The GPS receiver tracks the GPS constellation of satellites. The satellite signals received by an active antenna are tracked with 12 parallel channels of L1, C/A code and then down-converted to an IF frequency and digitally processed to obtain a full navigation solution of position, velocity, time and heading. The available data can be sent directly over GSM or GPRS network.

## 10.2 Technical data

**FEATURES**

- Integrated 12 parallel channel GPS
- The GPS antenna interface will be internal supplied with **(2.85 VDC)**
- Protocols message: SiRF binary and NMEA-0183, version 2.20 with a baud rate selection
  SiRF binary – position, velocity, altitude, status and control NMEA – CGA, GLL, GSA, GSV, RMC and VTG
- DGPS protocol: RTCM SC-104, version 2.00, type 1, 5 and 9

### 10.2.1 NMEA data message

The integrated GPS receiver inside the A2D-3JP3 supports data in the NMEA-0183 format.

**Note:** The FALCOM GPS/Alarm firmware and its libraries support the protocols of the GPS receivers JP3.

For further information about the programming and developing a firmware from the user side, it is recommended to read the programming manual "progmanxx.pdf" which is available on Falcom's website: www.falcom.de > **Service** > **Manuals** > **progmanxx.pdf**. It is also recommended to download the zip file which includes the sources (examples) and the libraries for programming A2D-3JP3. It also includes a "getting started" document for the developer-KIT.

Table below lists each of the NMEA output messages supported by the A2D-3JP3 evaluation receiver and a brief description. For further description about NMEA 0.2 Related documents. It can also be switched to the SiRF binary mode.

#### *10.2.1.1 NMEA output messages*

The table 3 below shows each of the NMEA output messages supported by the SiRFstarIIe Evaluation Receiver and a brief description.

| Option | Description |
|---|---|
| GGA | Time, position and fix type data. |
| GLL | Latitude, longitude, UTC time of position fix and status. |
| GSA | GPS receiver operating mode, satellites used in the position solution and DOP values. |
| GSV | The number of GPS satellites in view satellite ID numbers, elevation, azimuth and SNR values. |
| RMC | Time, date, position, course and speed data. |
| VTG | Course and speed information relative to the ground. |

**Table 18**: NMEA Output Messages

#### *10.2.1.2 NMEA input messages*

The table 4 below shows each of the NMEA input messages.

| Message | MID[1] | Description |
|---|---|---|
| SetSerialPort | 100 | Set PORT A parameters and protocol |
| NavigationInitialization | 101 | Parameters required for start using X/Y/Z[2] |
| SetDGPSPort | 102 | Set PORT B parameters for DGPS input |
| Query/Rate Control | 103 | Query standard NMEA message and/or set output rate |
| LLANavigation-Initialization | 104 | Parameters required for start using Lat/Lon/Alt[3] |
| Development Data On/Off | 105 | Development Data messages On/Off |
| MSK Receiver Interface | MSK | Command message to a MSK radio-beacon receiver. |

**Table 19:** NMEA Input Messages

1) **Message Identification (MID).**
2) **Input co-ordinates must be WGS84.**
3) **Input co-ordinates must be WGS84.**

**Note:** NMEA input messages 100 to 105 are SiRF proprietary NMEA messages. The MSK NMEA string is as defined by the NMEA 0183 standard.

- ***Transport Message***

| Start Sequence | Payload | Checksum | End Sequence |
|---|---|---|---|
| $PSRF<MID>[1] | Data[2] | *CKSUM[3] | <CR> <LF>[4] |

[1] **Message Identifier consisting of three numeric characters. Input messages begin at MID 100.**

[2] **Message specific data. Refer to a specific message section for <data>...<data>definition.**

[3] **CKSUM is a two-hex character checksum as defined in the NMEA specification. Use of checksums is required on all input messages.**

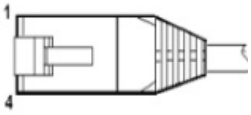
[4] **Each message is terminated using Carriage Return (CR) Line Feed (LF) which is \r\n which is hex 0D 0A. Because \r\n is not printable ASCII characters, they are omitted from the example strings, but must be sent to terminate the message and cause the receiver to process that input message.**

**Note:** All fields in all proprietary NMEA messages are required, none are optional. All NMEA messages are comma delimited.

# 11 Interfaces of A2D-3

## 11.1 Interface A

RJ11 power supply, Cable reference



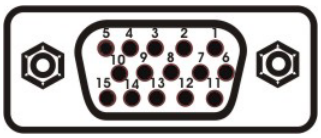

| Power input: +10.8 .. 31.2V DC | | |
|---|---|---|
| **Pin number** | **Name** | **Functions** |
| 1 | GND (white) | DC power negative input |
| 2 | Mute (yellow) | Do not connect |
| 3 | Ignition (green) | Ignition (connected to positive DC power) |
| 4 | Power supply (Brown) | DC power positive input |

**Table 20:** Pin-out of RJ11 power supply

The **Ignition** line is to switch the modem ON and OFF, especially in the motor vehicle. It must be connected to the positive pole (power supply).

## 11.2 Interface B

RS232 / V24 and 4 IO ports, 15 pin D-Sub




| PIN | NAME | DISCRIPTION | LEVEL |
|---|---|---|---|
| 1 | RxD | Receive serial data | Output |
| 2 | CTS | Clear To Send | Output |
| 3 | DSR | Data Set Ready | Output |
| 4 | DCD | Data Carrier Detect | Output |
| 5 | RI | Ring Indicator | Output |
| 6 | TxD | Transmit serial data | Input |
| 7 | DTR | Data Terminal Ready | Input |

| | | | |
|---|---|---|---|
| 8 | RTS | Request To Send | Input |
| 9 | GND | Ground | - |
| 10 | GND | Ground | - |
| 11 | IO1 | General propose input* | Input |
| 12 | IO2 | General propose input* | Output |
| 13 | IO3 | General propose input* | Input |
| 14 | IO4 | General propose output* | Output |
| 15 | OUT_K1 | output supply voltage for IO-signals | Output 10..31,2V DC (optional 5V DC) |
| * **The directions of the IO's refer to the FW GPS/Alarm of FALCOM. They could be configured by the user (see programming manual progmanxx.pdf).** | | | |

**Table 21:** Pin-out of interface B.

**Caution: Please connect the IO's 11-14 to supply voltage through a resistor (1 kOhm to 100 kOhm) for input current limiting during power-on.**

### 11.2.1 Electrical parameter of general IO ports

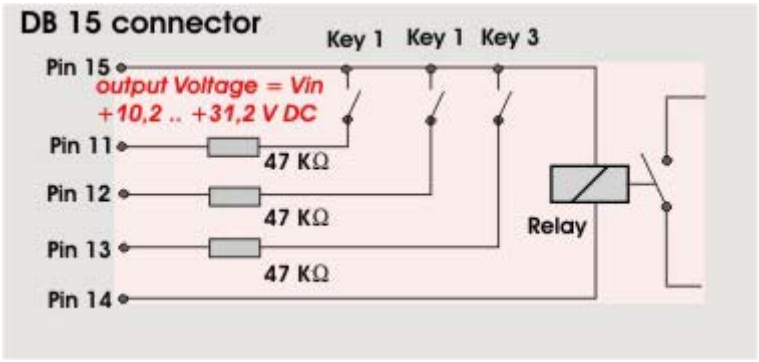
| Characteristics | Symbol | Limits | Unit |
|---|---|---|---|
| Output current per channal 1) | $I_{out\ max}$ | 200 | mA |
| Output voltage | $V_{out}$ | <= 31.2 | V |
| Input resistance | $R_{in}$ | 470 | KΩ |
| Input voltage Logic High | $V_{inH}$ | > = 4.5 | V |
| Input voltage Logic Low 2) | $V_{inL}$ | < =1.2 | V |
| Inputs-Outputs current limit 3) | $I_{IO's\ max}$ | 1 | A |

1) **The allowed maximum load current at the digital output (Pin14) is 200mA.**
2) **Or can be left open.**
3) **The allowed maximum load current by using all channels (IO's) together is 1 A (max.).**

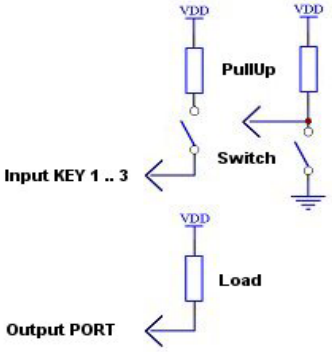
**Table 21:** Electrical parameter of I/O ports.

The minimal value of load resistance can be calculated as below ***:

$$*** R_{min} = \frac{U_{Pin\ 15}}{0{,}2\ A}$$

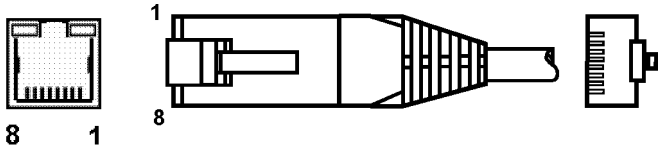



**Case: HL** **Case: LH**




### 11.2.2 Interface C

RJ 45 8 pin shielded ( Audio,RS232 )




| Pin | Description | Direction |
|---|---|---|
| 1 | 8 V output (**optional** output supply voltage for IO-signals 10.8 V ..31.2 VDC or 5.0 VDC) | OUT |
| 2 | TxD (Transmitted Data) | IN |
| 3 | RxD (Received Data) | OUT |
| 4 | Ground | - |
| 5 | SPK+ | OUT |
| 6 | SPK- | OUT |
| 7 | MIC+ | IN |
| 8 | MIC- | IN |

| CAUTION: | **Do not connect external DC-sources to the audio interface (RJ45), otherwise the modem will be damaged.** |
|---|---|

**Table 22:** Pin-out of interface C.

The LED's on the top side of this interface are for the following indication:

**LED yellow:** Power

**LED green:** Status

**(see corresponding chapter for LED's for working state of FALCOM A2D-3 and FALCOM A2D-3JP3)**

### 11.2.3 Interface D

GSM antenna 50 Ohm FME female

### 11.2.4 Interface E

GPS antenna 50 Ohm SMA female (option)
Antenna description: GPS antenna with LNA (low noise amplifier)
Frequency range: 1575.42 +/- 1.023 MHz
LNA gain: > = 25 dB
Power requirements: 5V +/- 0,5V max. 50 mA

### 11.2.5 SIM interface

SIM card holder for small SIM cards (3V only)

### 11.2.6 Digital interface

V.24 ( D-Sub 15pin )

### 11.2.7 Audio interface:

- Electret microphone
- Loudspeaker 150 Ohm
- Ground

### 11.2.8 Cable reference for connector 9 pin D-Sub (modem cable)

| DB15 | to | DB9 | |
|---|---|---|---|
| pin 4 | ----------► | pin 1 | (DCD) |
| pin 1 | ----------► | pin 2 | (RxD) |
| pin 6 | ----------► | pin 3 | (TxD) |
| pin 7 | ----------► | pin 4 | (DTR) |
| pin 9,10 | ----------► | pin 5 | (GND) |
| pin 3 | ----------► | pin 6 | (DSR) |
| pin 8 | ----------► | pin 7 | (RTS) |
| pin 2 | ----------► | pin 8 | (CTS) |
| pin 5 | ----------► | pin 9 | (RI) |

### 11.2.9 Cable reference for Input/Output connection:

**DB15**

| | | |
|---|---|---|
| pin11: | input KEY1 | (switch to supply voltage |
| pin12: | input KEY2 | or by pull up to ground) |
| pin13: | input KEY3 | |
| pin14: | output PORT | (connect load to supply voltage) |
| pin15: | VDD | |
| pin9,10: | GND | |

### 11.2.10 Data protocol

asynchronous, transparent and non transparent

**GSM 07.01, 07.02, 04.21**

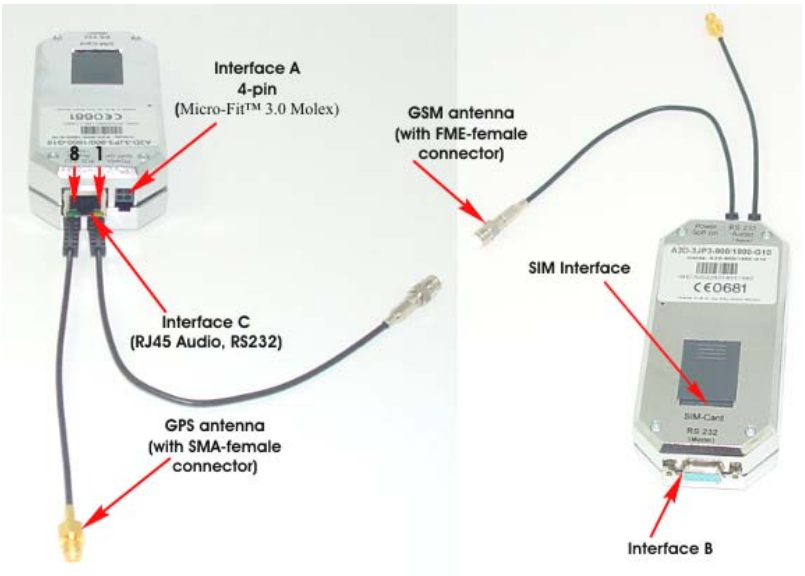
- 2400 bps V22bis
- 2400 bps V26ter
- 4800 bps V32
- 9600 bps V32
- 9600 bps V34
- 2400 bps V110
- 4800 bps V110
- 9600 bps V110

### 11.2.11 Short Message Service

GSM 03.40, 07.05

- SMS mobile originated
- SMS mobile terminated

# 12 A2D-3JP3




Interfaces of FALCOM A2D-3JP3

| General specification | |
|---|---|
| Dimensions | 115mm x 54mm x 33mm ( B x W x H ) |
| Weight | Approx. 200 g |

**Table 23:** General specification.

## 12.1 Power consumption

### 12.1.1 A2D-3-JP3-900/1800-G10 power consumption

| Power consumption | | | | |
|---|---|---|---|---|
| Power supply | +10.8...31.2 V DC | | | |
| Average current consumption at +12 V DC | | | | |
| GPS ON /GSM ON | 900 | 1800 | MHz | GSM band |
| | 110 | 110 | mA | in idle mode (base station sends at -85 dBm) |
| | 214 | 192 | mA | in transmit mode at power level 7/3 |
| | 249 | 232 | mA | in transmit mode at power level 5/0 (maximum) |

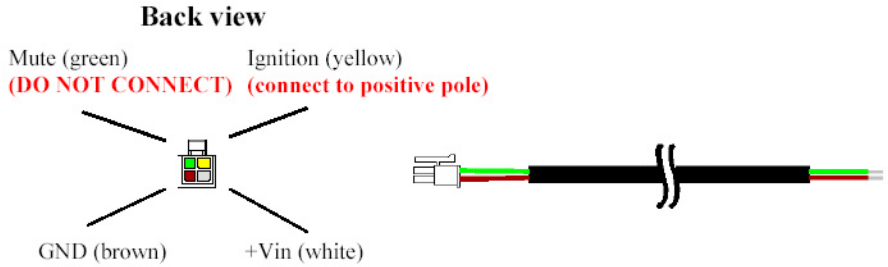
**Table 24:** Power consumption of A3D-3-JP3.

| Temperature limits | |
|---|---|
| Storage | -25°C to +70°C |
| Operating | -20°C to +55°C |

## 12.2 Interfaces of A2D-3JP3

### 12.2.1 Interface A

Molex 43045-0409



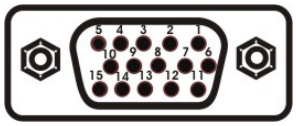

| Power input: +10.8 ... 31.2 V DC | | |
|---|---|---|
| **Pin number** | **Name** | **Functions** |
| 1 | GND (brown) | DC power negative input |
| 2 | Mute (green) | Do not connect |
| 3 | POWER (+Vin) | DC power positive input |
| 4 | IGN | Ignition (connected to positive DC power) |

**Table 25:** Pin-out of interface A.

The **Ignition** line is to switch the modem ON and OFF, especially in the motor vehicle. It must be connected to the positive pole (power supply).

### 12.2.2 Interface B

RS232 / V24 and 4 IO ports, 15 pin D-Sub




| PIN | NAME | DISCRIPTION | LEVEL |
|---|---|---|---|
| 1 | RxD | Receive serial data | Output |
| 2 | CTS | Clear To Send | Output |

| | | | |
|---|---|---|---|
| 3 | DSR | Data Set Ready | Output |
| 4 | DCD | Data Carrier Detect | Output |
| 5 | RI | Ring Indicator | Output |
| 6 | TxD | Transmit serial data | Input |
| 7 | DTR | Data Terminal Ready | Input |
| 8 | RTS | Request To Send | Input |
| 9 | GND | Ground | - |
| 10 | GND | Ground | - |
| 11 | IO1 | General propose input* | Input |
| 12 | IO2 | General propose input* | Input |
| 13 | IO3 | General propose input* | Input |
| 14 | IO4 | General propose Output* | Output |
| 15 | OUT_K1 | output supply voltage for IO-signals | Output +10..31,2V DC (optional 5V DC) |
| * The directions of the IO's refer to the FW GPS/Alarm of FALCOM. They could be configured by the user (see programming manual progmanxx.pdf). | | | |

**Table 26:** Pin-out of interface B.

**Caution:** **Please connect the IO's 11-14 to supply voltage through a resistor (1 kOhm to 100 kOhm) for input current limiting during power-on.**

### *12.2.2.1 Electrical parameter general IO ports*

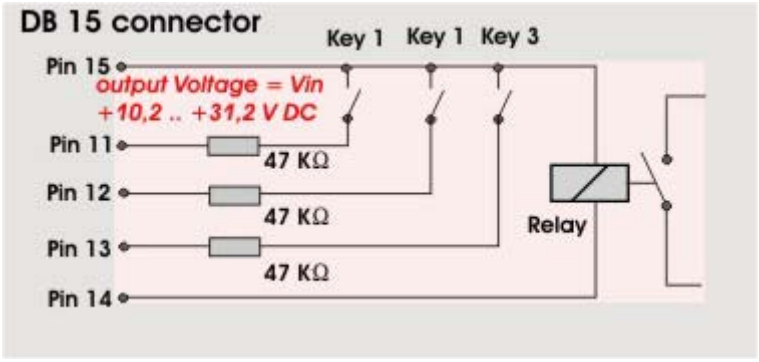
| Characteristics | Symbol | Limits | Unit |
|---|---|---|---|
| Output current per channal [1)] | $I_{out\ max}$ | 200 | mA |
| Output voltage | $V_{out}$ | <= 31.2 | V |
| Input resistance | $R_{in}$ | 470 | KΩ |
| Input voltage Logic High | $V_{inH}$ | > = 4.5 | V |
| Input voltage Logic Low [2)] | $V_{inL}$ | < =1.2 | V |
| Inputs-Outputs current limit [3)] | $I_{IO's\ max}$ | 1 | A |

1) **The allowed maximum load current at the digital output (Pin14) is 200mA.**
2) **Or can be left open.**
3) **The allowed maximum load current by using all channels (IO's) together is 1 A (max.).**

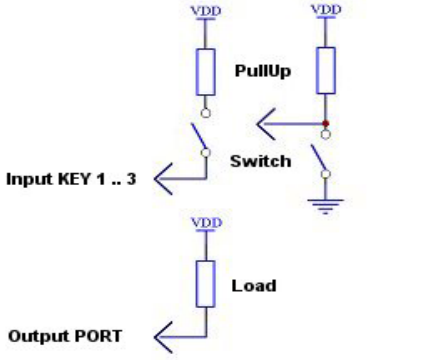
**Table 27:** General parameter of I/O ports.

The minimal value of load resistance***:

$$*** R_{min} = \frac{U_{Pin\ 15}}{0{,}2\ A}$$

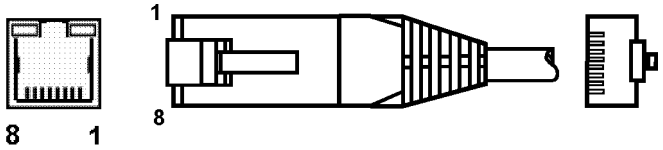



**Case: HL** **Case: LH**




### 12.2.3 Interface C

RJ 45 8 pin shielded ( Audio,RS232 )




| Pin | Description | Direction |
|---|---|---|
| 1 | 8 V output (**optional** output supply voltage for IO-signals 10.8 V … 31.2 VDC or 5,0 VDC) | OUT |
| 2 | TxD ← Transmitted Data | IN |
| 3 | RxD → Received Data | OUT |

| | | |
|---|---|---|
| 4 | Ground | - |
| 5 | SPK+ | OUT |
| 6 | SPK- | OUT |
| 7 | MIC+ | IN |
| 8 | MIC- | IN |
| **CAUTION:** | **Do not connect external DC-sources to the audio interface (RJ45), otherwise the modem will be damaged.** | |

**Table 28:** Pin-out of interface C.

The LED's on the top side of this interface are for the following indication:

**LED yellow:** Power

**LED green:** Status

**(see corresponding chapter for LED's for working state of FALCOM A2D-3 and FALCOM A2D-3JP3)**

### 12.2.4 Interface D

Antenna 50 Ohm FME female GSM

### 12.2.5 Interface E

Antenna 50 Ohm SMA female GPS (option)

Antenna description: GPS antenna with LNA (low noise amplifier)
Frequency range: 1575.42 +/- 1.023 MHz
LNA gain: > = 25 dB
Power requirements: 3V +/- 0,5V max. 50 mA

### 12.2.6 SIM interface

SIM card holder for small SIM cards (3V only)

### 12.2.7 Digital interface

V.24 ( D-Sub 15pin )

### 12.2.8 Audio interface

- Electret microphone
- Loudspeaker 150 Ohm
- Ground

### 12.2.9 Cable reference for connector 9 pin D-Sub (modem cable):

| DB15 | to | DB9 | |
|---|---|---|---|
| pin 4 | ----------► | pin 1 | DCD |
| pin 1 | ----------► | pin 2 | RxD (DCE) |
| pin 6 | ----------► | pin 3 | TxD (DCE) |
| pin 7 | ----------► | pin 4 | DTR |
| pin 9,10 | ----------► | pin 5 | GND |
| pin 3 | ----------► | pin 6 | DSR |
| pin 8 | ----------► | pin 7 | RTS |
| pin 2 | ----------► | pin 8 | CTS |
| pin 5 | ----------► | pin 9 | RI |

### 12.2.10 Cable reference for Input/Output connection:

| DB15 | | |
|---|---|---|
| pin11: | input KEY1 | (switch to supply voltage |
| pin12: | input KEY2 | or by pull up to ground) |
| pin13: | input KEY3 | |
| pin14: | output PORT | (connect load to supply voltage) |
| pin15: | VDD | |
| pin9,10: | GND | |

### 12.2.11 Data protocol

asynchronous, transparent and non transparent

**GSM 07.01, 07.02, 04.21**

- 2400 bps V22bis
- 2400 bps V26ter
- 4800 bps V32
- 9600 bps V32
- 9600 bps V34
- 2400 bps V110
- 4800 bps V110
- 9600 bps V110

### 12.2.12 Short Message Service

- GSM 03.40, 07.05
  - SMS mobile originated
  - SMS mobile terminated

# 13 Command List

## 13.1 Essential AT-Commands

| Command | Description |
|---|---|
| +++ | Switch to command mode when connected |
| ATA | Answer call |
| ATDx | Dial data number “x” |
| ATDx; | Dial voice number “x” |
| ATE0 | Disable command echo |
| ATE1 | Enable command echo |
| ATH | Disconnect existing connection |
| ATO | Return to data mode |
| ATS0=n | Go off-hook after $n^{th}$ ringing signal (n = “1”- “5”) |
| ATS0=0 | No automatic answering of calls |
| ATZ | Load stored profile |
| AT&C0 | DCD always ON |
| AT&C1 | DCD matches state of the remote modem’s data carrier |
| AT&D0 | Ignore DTR signal |
| AT&D1 | At DTR-> OFF: Switches from data to command mode |
| AT&D2 | At DTR-> OFF: Clear down the call |
| AT&W | Store current configuration |
| AT+IPR | Select the modem’s data rate |
| AT+IFC | Select the modem’s local flow control setting |
| AT+VGR | Tune the receive gain |
| AT+VGT | Tune the transmit gain |
| AT+VTD | Define DTMF tone duration |

| | |
|---|---|
| AT+VTS | Send DTMF tone |

**Table 29:** Essential AT-commands.

## 13.2 GSM AT Commands (GSM 07.07)

| Command | Description |
|---|---|
| AT+CBST | Select the bearer type |
| AT+CCFC | Control the call forwarding supplementary service |
| AT+CCWA | Control the call waiting supplementary service |
| AT+CFUN | Select the functionality level in the modem |
| AT+CGMI | Display manufacturer ID |
| AT+CGMM | Display model ID |
| AT+CGMR | Display version of GSM module |
| AT+CGSN | Display serial number (IMEI) |
| AT+CLCK | Change the PIN state or the call barring supplementary service |
| AT+CREG | Display network registration status |
| AT+COPS | Commands relating to network operator selection |
| AT+CPAS | Display the activity state of the mobile |
| AT+CPIN | Enter PIN and query blocks |
| AT+CPWD | Change PIN or the supplementary password |
| AT+CSQ | Display signal quality information |
| AT+CR | Select connection service report |
| AT+CRC | Select call service report |
| AT+CLIP | Calling line identification presentation |
| AT+CLIR | Control the calling line identification presentation |
| AT+COLP | Control the connected line identification presentation |
| AT+GCAP | Display the complete capability list |
| AT+CMEE | Report mobile equipment errors |

| | |
|---|---|
| AT+CEER | Extend error report |

**Table 30:** GSM AT-Commands.

## 13.3 SMS AT Commands (GSM 07.05)

| Command | Description |
|---|---|
| AT+CSCA | Service centre address |
| AT+CSCS | Select TE character set |
| AT+CSDH | Show text mode parameter |
| AT+CSMP | Select text mode parameter |
| AT+CSMS | Select message service |
| AT+CPMS | Preferred message storage |
| AT+CMGF | Text mode / PDU Mode |
| AT+CMGR | Read message |
| AT+CMGS | Send message |
| AT+CMGD | Delete message |
| AT+CMGL | List messages |
| AT+CNMI | New message indication |
| AT+CSAS | Save SMS Settings |
| AT+CRES | Restore SMS Settings |

**Table 31:** SMS AT-Commands.

## 13.4 Mobile equipment error result code : +CME ERROR: xxx

xxx is defined as below :

| Error Nr. | Description |
|---|---|
| 0 | Phone failure |
| 3 | Operation not allowed |
| 4 | Operation not supported |

| | |
|---|---|
| 10 | SIM not inserted |
| 11 | SIM PIN required |
| 12 | SIM PUK required |
| 13 | SIM failure |
| 16 | Incorrect password |
| 22 | Not found |
| 24 | Text string too long |
| 26 | Dial string too long |
| 30 | No network service |
| 256 | Protocol stack bad state |
| 257 | Bad cell |
| 258 | Lost cell |

**Table 32:** Error result code.

## 13.5 Message service failure result code: +CMS ERROR : xxx

xxx is defined as below :

| **Error Nr.** | **Description** |
|---|---|
| 1 to 127 | error cause values from the GSM recommendation 04.11 Annex E-2 |
| 301 | SMS service of ME reserved |
| 302 | Operation not allowed |
| 303 | Operation not supported |
| 305 | Invalid text mode parameter |
| 313 | SIM failure |
| 321 | Invalid memory index |
| 322 | SIM memory full |
| 330 | SC address unknown |

| | |
|---|---|
| 512 | Sending and receiving SMS at the same time. The outgoing SMS could be rejected |
| 513 | -Mobile Station loses the radio link<br>-Mobile Station does not receive the acknowledge from the network about 28s after transmission of SMS<br>-Mobile Station does not receive the acknowledge from the network about 42s after the channel establishment request |
| 514 | -Service Center Address is wrong<br>-Destination address is wrong<br>-The SMS has been refused by the network (destinatio number is not GSM one, the service center is wrong, the service is not available...) |
| 515 | Please wait, init or command processing in progress |

**Table 33:** Message service error result code.

## 13.6 Essential &-Commands (GPS/Alarm-Commands)

| **Alarm-Commands** | ***Commands Description*** |
|---|---|
| &cnf pin | *Activate/Deactivate automatical input of the PIN number* |
| &req pos | *Print GPS snapshot* |
| &req int | *Print GPS positions* |
| &req last | *Print last valid GPS snapshot* |
| &req fix | *Initiate message* |
| &req fail | *Print stored messages* |
| &clr fail | *Delete stored messages* |
| &cnf nmea | *Input command to GPS* |
| &req sms | *Print all SMS stored on the SIM card* |
| &clr sms | *Delete all SMS stored on the SIM card* |
| &req cnf | *Print configuration* |
| &req tm | *Print copyright and release notes* |
| &req time | *Print time* |
| &cnf time | *Set time* |

| | |
|---|---|
| &cnf gsm | *Set GSM initialisation* |
| &cnf gps | *Set GPS protocol and earth datum* |
| &cnf msg | *Set message configuration* |
| &cnf boot | *Set power on message* |
| &cnf key | *Set response for input events* |
| &cnf port | *Set output configuration* |
| &cnf clip | *Set message for incoming calls* |
| &cnf mode | *Set mode and message counter* |
| &pass | *Set or change password* |
| &licence | *Enter licence key* |
| &system | *Enter Mon186 service mode* |
| &debug | *Set debug level* |
| &cnf ign | *Configuration the ignition line for switch ON/OFF the modem* |

**Table 34:** GPS/Alarm-Commands.

# 14 Configuration examples

## 14.1 Activate and deactivate the automatical input of the PIN number *&CNF PIN*

This command is used to activate or deactivate the automatical input of the PIN-Nr. of the SIM Card.
The value zero (**&CNF PIN=0**) deactivates the automatical input, that means the user must enter the PIN-Nr. of the SIM Card after each switch on the device. However, the value one (**&CNF PIN=1**) activates the automatical input of the PIN-Nr., that means the device memorizes the last entered PIN-Nr.. Note that the processor memorizes a PIN-Nr. of „**1111**“. If the PIN-Nr. of the SIM Card is **1111** then the user cannot deactivate the automatical input of the PIN-Nr.

**Example 1: &CNF PIN=0 and &CNF PIN=1**

```
Input:   &CNF PIN=0          // Deactivate the automatical input
                                of the PIN-Nr.
Output:  OK
                              // Switch modem off then on again
Input:   at+cpin?
Output:  +CPIN: SIM PIN
Input:   at+cpin=2037
Output:  OK

Input:   &CNF PIN=1          // Activate the automatical
                                      input of the PIN-Nr.
Output:  OK

Input:   at+cpin=2037
Output:  OK
                             // Switch modem off then on again
Input:   at+cpin?
Output:  +CPIN: READY
```

## 14.2 Obtaining GPS Position Data *&REQ POS*, *&REQ INT*, *&REQ FIX*, *&REQ LAST*

These commands are used for obtaining GPS navigational data from the internal GPS receiver. The data are given in the format specified during the initialization or as specified manually. **&REQ POS** returns a single set of positional data, while **&REQ INT** continuously obtains positional data, until the next command is entered. Using **&REQ FIX** one can generate a message to check the message configuration or to poll data from the modems. The latest valid single shoot of positional data will be returned by using **&REQ LAST**. The **&REQ FIX** and **&REQ LAST** commands can have an additional parameter which named a receiver number. If this parameter is missing the requested message will be delivered to the standard message receiver. The message number setting follow the guidelines for the phone number parameter.

**Example 2: &REQ POS; &REQ INT; &REQ FIX and &REQ LAST**

```
Input: &REQ POS                  // Print GPS Snapshot
Output:$GPGGA,104220,5040.3711,N,01058.8452,E,1,06,2.1,489.
6,M,46.8,M,,*48

Input: &REQ INT                  // Print GPS Positions
Output:
   $GPGGA,114244,5040.3617,N,01058.8437,E,0,03,2.0,483.4,M,
   46.8,M,,*46
   $GPGGA,114245,5040.3619,N,01058.8436,E,0,03,2.0,483.6,M,
   46.8,M,,*4A
   $GPGGA,114246,5040.3621,N,01058.8436,E,0,02,2.1,483.7,M,
   46.8,M,,*42
   $GPGGA,114247,5040.3623,N,01058.8436,E,0,02,2.1,483.8,M,
   46.8,M,,*4E
   $GPGGA,114248,5040.3624,N,01058.8436,E,0,02,2.1,484.0,M,
   46.8,M,,*49
   $GPGGA,114248,5040.3624,N,01058.8436,E,0,02,2.1,484.0,M,
   46.8,M,,*49
Input: &REQ LAST                 // Print last valid GPS
                                    Snapshot
Output:
   $GPGGA,104250,5040.3624,N,01058.8436,E,1,06,2.1,484.0,M,
   46.8,M,,*49
Input: &REQ FIX,s01715543007     // Initiate a SMS
                                    to 01715543007
Output:OK
```

## 14.3 Request or Clear Stored Messages *&REQ FAIL*, *&CLR FAIL*

Outgoing messages will be first stored in message memory. Both commands are used to print or clear these stored messages. Messages that could not be sent because of low field strength or malfunction remain in that message memory until a transmission was successful. The memory for that function is calculated for a maximum of 16 messages with 160 Byte length. **&REQ FAIL** is implemented to ask for the stored messages. The memory can be erased with the command **&CLR FAIL**.

**Example 3: &REQ FAIL and &CLR FAIL**

```
Input: &REQ FAIL // Print stored (unsent) messages
Output:7982573,$ALARM,alarmExtension button2,05.47.52,
       $GPRMC,054752,A,5040.4213,N,1058.8680,E,001.1,000.0,140400,000.8,E*71
       7982573,$ALARM,alarm extension button2,05.47.54,
       $GPRMC,054754,A,5040.4213,N,1058.8680,E,001.1,000.0,140
       400,000.8,E*71
       OK
Input: &CLR FAIL // Delete stored (unsent) messages
Output:OK
```

## 14.4 Request or Clear SMS Messages *&REQ SMS*, *&CLR SMS*

All SMS messages from the SIM-CARD storage can be displayed or deleted with these two simple commands. The command **&REQ SMS** is

implemented to ask for the stored messages. The SIM-CARD storage memory for SMS can be erased with the command **&CLR SMS**.

**Example 4: &REQ SMS and &CLR SMS**

```
Input:&REQ SMS        //Print all SMS srtored in the SIM
                        Card
Output:
   [01] GPRMC,213323.420,V,5042.0064,N,01101.7744,E,,,180201,,*1A
   [02] $GPRMC,213911.502,V,5042.1459,N,01101.5351,E,,,180201,,*19
   [03] $GPRMC,214225.941,V,5042.1459,N,01101.5351,E,,,180201,,*19
   [04] $GPGGA,215604.899,5042.2133,N,01101.1644,E,1,03,2.1,0.0,M,,,,
        0000*05
   [05] $GPGGA,221909.261,5042.1506,N,01101.5471,E,1,03,3.1,0.0,M,,,,
        0000*02
   [06] $GPGGA,222656.669,5042.1568,N,01101.5250,E,1,05,3.9,0.0,M,,,,
        0000*0F
   [07] $GPGGA,224519.856,5042.1568,N,01101.5308,E,1,05,3.7,0.0,M,,,,
        0000*01
   [08] $GPGGA,070042.811,5040.4188,N,01058.8347,E,1,07,1.1,0.0,M,,,,
        0000*06
   [09] Das_ist_ein_Test_String,09.50.16
   [10] Das_ist_ein_Test_String,10.06.27
 OK
Input: &CLR SMS  // Delete all SMS from SIM Card

Output:OK
```

## 14.5 Request Configuration *&REQ CNF*, *&REQ TM*, *&REQ HELP*

Using **&REQ CNF** the user can get the configuration data out of the GSM modems, **&REQ TM** prints the copyright and firmware version, and **&REQ HELP** shows a short help index.

**Syntax**

| | |
|---|---|
| **&REQ CNF** | |
| **$CNFGPS,gps_protocol,gps_datum,time** | *// GPS configuration* |
| **$CNFGSM,pin,init** | *// GSM configuration* |
| **$CNFMSG,password,SCSA,recipient,interval,mode** | *//Message configuration* |
| **$CNFNAME,name** | *// Name configuration* |
| **$CNFBOOT,recipient,"message",flags** | *// Start-up message* |
| **$CNFKEY1,recipient,"message",flags** | *// key1 event message* |
| **$CNFKEY2,recipient,"message",flags** | *// key2 event message* |
| **$CNFKEY3,recipient,"message",flags** | *// key3 event message* |
| **$CNFCLIP,central,number1,number2,...** | *//incoming call event* |

**Example 5: &REQ CNF; &REQ TM and &REQ HELP**

```
Input: &REQ CNF        //Print configuration
Output:
   $CNFGPS,GPGGA:GPRMC,100,0
   $CNFGSM,1111,at+cbst=7,0,1
   $CNFMSG, s01701234567,"my modem",0,G
```

```
   $CNFBOOT,s01701234567,"boot message",L
   $CNFKEY1,s01701234567,"alarm extension button1",LP
   $CNFKEY2,d01701234567,"alarm extension button2",LP
   $CNFKEY3,v036778042230,"hallo",L
   $CNFCLIP,d01701234568,+491727982572,+49367780420
   OK
Input:  &REQ TM  //Print copyright and firmware version
Output: FALCOM A2D-GPS TckJWK9tjtB!!V1.56 - 28.01.2002 (c)
2001
        FALCOM GmbH
       OK
Input:  &REQ HELP // show a short help index
Output: FALCOM A2D-GPS brQSPp3u5z501 V1.56 - 28.01.2002
        (c) 2001 FALCOM GmbH

commands for communication

&req pos/int/last          // print gps snapshot/positions
&req/clr fail              // print/delete pending messages
&req/clr sms               // print/delete sms from simcard
&req fix                   // sending gps message
&req time                  // print time
&req cnf                   // print configuration
&req tm                    // print copyright
&cnf gsm=pin,gsm_init      // set gsm initialization
&cnf gps=protocol,zone     // set gps protocol,zone
&cnf msg=recv,name,timer   // set message configuration
&cnf boot=recv,name,flags  // set power on message
&cnf key=recv,name,flags   // set response for key changes
&cnf port=mode,time1,time2 // set output signals
&cnf clip=recv,num,...     // set response for incoming calls
&cnf mode=mode,counter     // set mode and message counter
&cnf time=time,date        // set time
&pass=passwd               // set password
&licence=number            // set firmware licence number
&system[=pwd,recv]         // enter MON186 interactive mode
OK
```

## 14.6 Device Configuration *&CNF GSM*, *&CNF GPS*, *&RESET*

These commands are used to configure the GPS receiver and the GSM module inside the modems. **&CNF GSM** sets the pin number of the SIM card, and an additional AT command is used during the initialisation and **&RESET** is used to restart the GSM module. **&CNF GPS** sets the GPS protocol and the required geographical earth datums of the GPS receiver. The GPS receiver can be configured to report different protocols. To enable different GPS protocol sequences the user should combine the necessary NMEA protocol names with a colon as delimiter. These settings are used after start-up the GSM modems to initialize the internal GPS receiver.

**Syntax**

```
&CNF GSM,pin,command       // GSM configuration
```

**Parameters description**

**pin** : 0000 ... 9999, pin number of the SIM card
**command:** additional initialisation for the GSM module

```
&RESET                     // Reset GSM module
```

```
&CNF GPS,protocol,zone     // GPS configuration
```

**Parameters description**

| | | |
|---|---|---|
| **protocol** | **:** | Initialised NMEA protocols |
| **zone** | **:** | earth datums (100 means WGS 84) |

**Example 6: &CNF GSM; &CNF GPS and &RESET**

```
Input: &CNF GPS,GPGGA;GPRMC,100     // Set GPS Protocols
Output:OK
Input: &CNF GSM,1234,at+cbst=7,0,1  // Set GSM initialization
Output OK
Input: &REQ CNF                     // Print configuration
Output:
   $CNFGSM,1234,at+cbst=7,0,1
   $CNFMSG,s01723651777,"my modem",0,pwd,D
   $CNFBOOT,01701234567,"boot message",L
   $CNFKEY1,s01701234567,"alarm extension BTN1",LP
   $CNFKEY2,d01701234567,"alarm extension BTN2",LP
   $CNFKEY3,v036778042230,"hallo",L
   $CNFCLIP,s01701234568,+49367723456
OK
Input: &RESET                       // Reset the device
Output:OK
```

## 14.7 Message Configuration *&CNF○MSG*, *&CNF○MODE*

The command **&CNF○MSG** sets receiver phone number, and device name, **&CNF○MODE** sets the functional mode and a configuration counter. By setting a password within the configuration data access to the module will be restricted for further data communication. The recipient number setting holds as first character additional information about the message transmission. If the first character of the recipient number is **D** or **d** the message will be sent as data. If the first character of the recipient number is **S** or **s** the message will be sent as SMS . If the first character of the recipient number is **G** or **g** the GPS/ALARM firmware tries to call this number and will send GPS data to the recipient. This setting is similar to the automatic GPS mode (mode setting **G**) and the GPS data can be stopped by inputting a valid command sequence. In all other cases the recipient number will be treated as a phone number for a SMS transmission. The SMS service center setting will be used from the SIM-CARD and could be changed by using the AT-Command set for the SMS functions. By using the command **AT+SCSA** you can change the current SMS service center number, and by **AT+CSAS** you can save this setting. The name of the unit could contain format sequences which begin with the backslash \ character. See below possible format sequences:

| | |
|---|---|
| **\r** | **- carriage return** |
| **\n** | **- newline** |
| **\t** | **- linefeed (carriage return and new line)** |
| **** | **- backslash** |
| **\o** | **- comma** |
| **\xx** | **- hexadecimal character code (00 to ff)** |

Additionally the name setting can be enclosed with **'** or **"** apostrophe marks. In that case all characters enclosed in apostrophes will be used as string for the name setting (including enclosed commas).

**Syntax**

```
&CNF MSG,receiver,''name'',period // Message configuration
```

**Parameters description**

**receiver** : *Call number of recipient for SMS or data*
**name** : *Device name setting*
**period** : *0 ... 9999 min. 0 means no periodical message*

```
&CNF MODE,mode,time          // Mode configuration
```

**Parameters description**

**mode** : *Functionality mode*
**D** – *automatically answers data calls (similar to ATS0=1)*
**G** –*automatically answers data calls and reports GPS protocols*
**T** – *automatically append time to input messages*
**V** – *automatically answers voice calls*
**C** – *configuration counter*
**B** – *break reset mode*

**Counter** : *0 ... 255*

In the configuration counter mode every command will increase the configuration counter. The value of this counter will be set in a position message and can be used to check the configuration of the GSM modems. A checksum of a command will be automatically calculated and compared if a checksum sequence „*XX“ appended to the contents of a command. The checksum will be calculated as a XOR summary of all characters of this command. There are two answer modes as reaction to data calls. If the mode setting contains a **D** character then
the unit answers automatically incoming data calls. This mode is identical to the **S0** parameter of the GSM module (**ATS0=1**). If the mode setting contains a **G** character then the data of the connected GPS receiver are responsible over a GSM data connection. The streaming of the GPS protocols over the GSM data connection can be stopped by inputting a valid AT- or &-Command of the supported command set. If both modes are configured the **G** mode will be the preferred mode. In all other cases the terminal equipment on the DB15 must answer the incoming calls, and it has the possibility to receive specific data over the GSM network (tracking, map or delivery information). Please change the **ATS0** register for automatic data transmissions or use the configuration with the additional features by the **&CNF MODE** command.

**Example 7: &CNF MSG and &CNF MODE**

```
Input: &REQ CNF
Output:
  $CNFGPS,GPGGA,100,0
  $CNFGSM,1234,at+cbst=7,0,1
  $CNFMSG,01723651777,"my name",0,pwd,D
  $CNFBOOT,01701234567,"boot message",L
  $CNFKEY1,s01701234567,"alarm extension BTN1",LP
  $CNFKEY2,d01701234567,"alarm extension BTN2",LP
  $CNFKEY3,v0367712349,"hallo",L
```

```
   $CNFCLIP,s01701234568,+49367723456
OK
Input: &CNF MSG,d01723344555,"CAR100",5 //Send data Message in
                                          5 min period
Output:OK
Input: &REQ CNF*00                      // Command without checksum
Output:ERROR
Input: REQ CNF*0A                       // Checksum ok
Output:
   $CNFGPS,GPGGA,100
   $CNFGSM,1234,at+cbst=7,0,1
   $CNFMSG,d01723344555,"CAR100"5,pwd,D
   $CNFBOOT,01701234567,"boot message",L
   $CNFKEY1,s01701234567,"alarm extension BTN1",LP
   $CNFKEY2,d01701234567,"alarm extension BTN2",LP
   $CNFKEY3,v0367712349,"hallo",L
   $CNFCLIP,s01701234568,+49367723456
OK
Input: &CNF MSG,s01723344555,"CAR100",5 // Send SMS In 5min
                                          period
Output:OK
Input: &CNF MODE,D,0    // Answering data calls automatically
Output:OK
Input: &REQ CNF
Output:
   $CNFGPS,GPGGA,100
   $CNFGSM,1234,at+cbst=7,0,1
   $CNFMSG,s01723344555,"CAR100",5,pwd,D
   $CNFBOOT,0701234567,"boot message",L
   $CNFKEY1,s01701234567,"alarm extension BTN1",LP
   $CNFKEY2,d01701234567,"alarm extension BTN2",LP
   $CNFKEY3,v0367712349,"hallo",L
   $CNFCLIP,s01701234568,+49367723456
OK
```

## 14.8 Poll Event Configuration *&CNFOCLIP*

This command is used to configure the GSM modems to trigger a message as answer to an incoming call. By the command **&CNFOCLIP** valid phone numbers can be entered which enable to poll the GSM modems. The memory for storing the valid phone numbers is limited up to 15 numbers. The message could be sent via data or SMS depending on the recipient setting. If the first character of the recipient number contains **D** or **d** the message will be sent as data. If the first character of the recipient number contains **S** or **s** the message will be sent as SMS. If the first character of the recipient number is **G** or **g** the GPS/ALARM firmware tries to call this number and it will send GPS data to the recipient. This setting is similar to the automatic GPS mode (mode setting **G**) and the streaming of the GPS protocols over the GSM data connection can be stopped by inputting a valid AT- or &-Command of the supported command set. In all other cases the recipient number is treated as phone number for SMS transmission. Please note that the phone numbers for incoming calls are displayed as international numbers and must be configured in the same way. If the receiver field is empty a message (data or SMS) will be generated and sent back to the incoming caller number. For that case the kind of message must be included as first character to every caller number in the same way like the extensions for the receiver number.

**Syntax**

```
&CNF CLIP,receiver,numbers,... // Poll message configuration
```

**Parameters description**

**receiver :** *Call number of recipient for SMS or data*
**numbers :** *Activated phone numbers, amount 1..15*

**Example 8: &CNF CLIP**

```
Input: &CNF CLIP,d01701234568,+4976543212,+49367723456
Output:OK                                    // polling enabled
Input: &REQ CNF
Output:
  $CNFGPS,GPGGA,100,0                        // GPS configuration
  $CNFGSM,1234,at+cbst=7,0,1                 // GSM configuration

  $CNFMSG,s01723344555,"CAR100",5,pwd,D      // SMS message in 5min
                                                period
  $CNFBOOT,01701234567,"boot message",L
  $CNFKEY1,s01701234567,"alarm extension BTN1",LP
  $CNFKEY2,d01701234567,"alarm extension BTN2",LP
  $CNFKEY3,v036778042230,"hallo",L
  $CNFCLIP,s01701234568,+49367723456
OK
```

## 14.9 Setup Input Events *&CNFOBOOT*, *&CNFOKEY*

These commands configure the handling for start-up or input events. By the command **&CNFOKEY** the inputs for the alarm functions can be configured. The command **&CNFOBOOT** defines an event that will be sent after switch on the modems. If the first character of the recipient number is **D** or **d** the message will be sent as data. If the first character of the recipient number is **S** or **s** the message will be sent as SMS. If the first character of the recipient number is **V** or **v** the event triggers a voice call to the recipients number. If the first character of the recipient number is **G** or **g** the GPS/ALARM firmware tries to call this number and it will send GPS data to the recipient. This setting is similar to the automatic GPS mode (mode setting **G**) and the streaming of the GPS protocols over the GSM data connection can be stopped by inputting a valid AT- or &-Command of the supported command set. In all other cases the recipient number is treated as phone number for SMS transmission.. The text of the input event could contain format sequences which begins with the backslash '\' character. See below possible format sequences:

**'\r' - carriage return**
**'\n' - newline**
**'\t' - linefeed (carriage return and new line)**
**'\\' - backslash**
**'\o' - comma**
**'\xx' - hexadecimal character code ( '00' to 'ff' )**

Additionally the text setting can be enclosed with ' or " apostrophe marks. In this case all characters enclosed in apostrophes will be used as string for the text setting (including enclosed commas).

## Syntax

```
&CNF KEY,key number,receiver,"text",flagP  // Configuration
                                              input key event
```

**Parameters description**

**key number** : *1..3 correspond to input GIO1..GIO3*

**receiver** : *Call number of receipient for SMS or data.*

**text** : *Text message that is sent with an input event, in addition a time mark is appended and an optional GPS protocol, too.*

**Flag** : *Kind of input trigger: **H** means a **Low/High** input change, **L** means a **High/Low** input change, **E** means any input changes (**H** or **L**), and **P** adds a GPS protocol to the message text.*

```
&CNF BOOT,receiver,"text",flagP // Configuration start
                                   event
```

**Parameters description**

**receiver** : *Call number of recipient for SMS or data.*

**text** : *Text message that is sent after start, in addition a time mark is appended and an optional GPS protocol*

**flag** : *Kind of input trigger, **H** means a **Low/High** input change, **L** means a **High/Low** input change, **P** added a GPS protocol to the message text.*

## Example 9: &CNF BOOT and CNF KEY

```
Input: &REQ CNF            // Print configuration
Output::
   $CNFGPS,GPGGA,100
   $CNFGSM,1234,at+cbst=7,0,1
   $CNFMSG,s01723344555,"CAR100",5,pwd,D
   $CNFBOOT,01701234567,"boot message",L
   $CNFKEY1,s01701234567,"alarm extension BTN1",LP
   $CNFKEY2,d01701234567,"alarm extension BTN2",LP
   $CNFKEY3,v0367712349,"hallo",L
   $CNFCLIP, s01701234568,+49367723456
OK
Input: &CNF BOOT,d01701234567,"startup A2GPS",hp
                           // Send  data message after start
                           up
Output:OK
Input: &CNF KEY,3,d01701234567,"alarminput BTN3",hp
                           // Send data message
Output:OK
Input: &REQ CNF
Output:
   $CNFGPS,GPGGA,100,0
   $CNFGSM,1234,at+cbst=7,0,1
   $CNFMSG,s01723344555,"CAR100",5,pwd,D
   $CNFBOOT,01701234567,"boot message",L
   $CNFKEY1,s01701234567,"alarm extension BTN1",LP
   $CNFKEY2,d01701234567,"alarm extension BTN2",LP
   $CNFKEY3,d01701234567,"alarm input BTN3",HP
   $CNFCLIP,s01701234568,+49367723456
OK
```

## 14.10 Initiate Output Actions *&CNFOPORT*

This command configures the GIO4 output with different signals. With this command a static high or low state as well as a single output impulse or a continuously cycle can be switched. Please refer to chapter 4 "**TECHNICAL DATA**" for the electrical characteristics of the output driver of the GSM modems FALCOM A2D-3 and A2D-3JP3 as well as A3D.

**&CNF PORT,signal,time1,time2** - configuration output action GPIO4

**Parameters description**

**signal** : *Kind of output signal. **E** means output active, **A** means output inactive, **I** means an impulse of **time1** delay and **Z** means a cyclic active/inactive output wave with **time1** and **time2** delays duration.*

**time1, time2** : *Timer settings in steps of 10msec for impulse or cyclic output signal configuration*

**Example 10: &CNF PORT**

```
Input: &CNF PORT,z,100,100      // flash output with 2sec
duration
Output:OK
Input: &CNF PORT,i,100,0        // Generate 1sec output impulse
Output:OK
```

## 14.11 Passing or changing the password *&PASS*

This command enables communications with the modems for local access, data connection or setting via SMS if a password has been set in the configuration. To change an existing password the command must be configured with the new password and with the actual password. Before each remote configuration command (SMS) the user has to send the correct password.

**Syntax**

**&PASS,PassWord** *Configuration command // Set the password*

**Example 11: &PASS**

```
Input: &PASS,Test;&CNFGPS,GPGGA,100 // Enter Password and
                                       command per SMS
Input: &REQ CNF                    // Command without
                                   password through terminal
Output:ERROR
Input: &PASS,Test;&REQ CNF          //Command with password
                                    through terminal
Output:
  $CNFGPS,GPGGA,100
  $CNFGSM,1234,at+cbst=7,0,1
  $CNFMSG,TEST, +4901722270000,s01723344555,5,D
  $CNFNAME,CAR100
  $CNFBOOT,01701234567,"boot message",L
  $CNFKEY1,s01701234567,"alarm extension BTN1",LP
  $CNFKEY2,d01701234567,"alarm extension BTN2",LP
  $CNFKEY3,d01701234567,"alarm input BTN3",HP
  $CNFCLIP,d01701234567,+4976543212,+493667723456
OK
```

## 14.12 Setup firmware Licence Number *&LICENCE*

The GPS/ALARM firmware is sold additionally to the pre-installed version as package, too. The firmware as well as the updates can be downloaded from the homepage of FALCOM www.falcom.de. For the release of the complete functionality of the firmware a licence number is required. This licence number you can get through conventional sales or by order per email. The command &LICENCE is for the release of the GPS/ALARM firmware.

**IMPORTANT:**

- When the user enters the licence key he has to consider the small and capital letters (case sensitive), otherwise the firmware could not be activated.
- After a successful activating of the firmware and if the user enters again a wrong licence key he will deactivate the firmware again. He must enter the correct one again.

**Syntax**

```
&LICENCE=xxxxxxxxxxxxxxx        //  Release full functionality
xxxxxxxxxxxxxxx:                //  Licence number
```

**Example 12: &LICENCE**

```
Input: &REQ POS                 // Show GPS position
Output:ERROR
Input: &LICENCE=iqqJQE6WYf401*  // Release full functionality
                                   of the firmware
Output:OK
Input: &REQ POS                 // Show GPS position
Output:
   $GPRMC,092955.505,A,5040.3981,N,01058.8667,E,0.03,3
   06.09,121201,,*0E
   *) Note that this licence key is an example and it is not
   the correct key for your device.
```

## 14.13 Debugging and Update *&SYSTEM*, *&DEBUG*

These commands are implemented for using the Mon186, the operating system of the FALCOM A2D-3, A2D-3JP3, **A3D-JP3** and A3D. With the commands of the Mon186, the operating system of the modems, a simple debugging, update of the running application or configuration of the whole device is possible. For an overview of the commands please refer to the „Programming Manual“ which could be downloaded from FALCOM's Homepage.

**Syntax**

```
&SYSTEM,[password],[recipient]  // Request monitor
```

**Parameters description**

**Password** : *// leave empty for no password*
**recipient** : *// Call number of SMS or data recipient*

Both parameters are only necessary in a configuration via SMS and mean a receiver modem is able to answer a data call and a password is limiting the

access for the communication. The next example demonstrates an upgrade of an existing application.

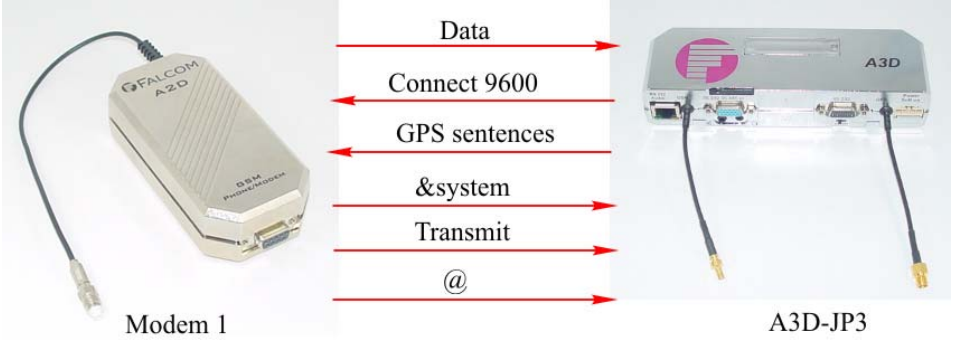
**Example 13: &SYSTEM**

```
at
OK
&system
Welcome to AMD186 Monitor ( ? <Enter> for help )
mon186: ?                        // Help
mon186: L                        // Show applications
1   80000    gps153
mon186: xz                      // Delete flash
Erasing flash sector(s) ... 8000
mon186: w gps154                 // Write application GPS
Begin file download ... Press ESC to abort  // Send text file
                                                GPS.HEX
.....................................................
.....................................................
.........................
Device programmed successfully
Mon186: P BOOT "18432000,1,L"   //  Set  GPS  firmware  as
                                autostart
mon186: @                       //  Reset  modem  and  Run  GPS
                                firmware

at
OK
&req tm
FALCOM A2D-GPS brQSPp3u5z501 V1.56 - 28.01.2002 (c) 2001
FALCOM GmbH
OK
```

**Example 14: update the firmware per air interface**

For updating the GPS/Alarm firmware remotely for example the Modem FALCOM A3D it must be configured by the following commands:
**&CNF MODE,G,0**
**&CNF GPS,GPRMC,100** or another GPS-Protocol like **GPGGA**, **GPGSV**,**GPGSA**,**GPGLL** or **GPVTG**.
If you make a data connection from another modem (**Modem1**) with **FALCOM A3D** you will get automatically the GPS sentences sent from FALCOM A3D.
Now you can type the command **&system** which switches the FALCOM A3D to Mon186 remotely, then you can send the text file GPS.HEX, and after a successful transmission type the command **@**. Your modem will lose the data connection because the FALCOM A3D will be initialised after running the command **@**.



**&DEBUG**

For using the built-in debug facilities of the GPS/ALARM firmware the command &DEBUG can be used. With this command the current debug level of the application can be changed to produce more or less useful additional messages while the application is running. The debug level equals 0 is standard setting after restart the FALCOM A3D with the GPS/ALARM firmware and means all debug messages are disabled.

**Syntax**

```
&DEBUG=debuglevel  // Set debug level of the firmware
```

**Parameter description**

**debuglevel:** *debug level from 0..255*

**Example 15: &DEBUG**

```
Input: &req tm      // Print copyright and firmware revision
Output:
   FALCOM A2D-GPS brQSPp3u5z501 V1.56 - 28.01.2002
   c) 2001 FALCOM GmbH
OK
Input: &debug=15
Output:OK

gsm_cmd8981772(38ms)'AT+CCED=0,5','+CCED:
262,01,5518,1a02,30,37,32,,,0,,,0,4,'OK' mode(24)
gsm_cmd 8991750(37ms)'AT+CCED=0,5','+CCED:
262,01,5518,1a02,30,37,32,,,0,,,0,4,'OK' mode(24)
gsm_cmd 9001133(16ms) 'AT+CPAS','+CPAS: 0','OK' mode(24)
gsm_cmd9001161(15ms)'AT+CPIN?','+CPIN:  READY','+CPIN:  READY'
mode(24)
gsm_cmd 9001191(17ms) 'AT+CREG?','+CREG: 0,1','OK' mode(24)
gsm_cmd 9001221(17ms) 'AT+CSQ','+CSQ: 17,0','OK' mode(24)
gsm_cmd9001251(24ms)'AT+CPMS?','+CPMS:
"SM",0,15,"SM",0,15','OK' mode(24)
gsm_sms_delete 9001251(41ms) sms <0,15> error 1
gsm_signal 9001133(183ms) gsm_mode 0x24

Input: &req tm
process_cmd 8975468 '&req tm' (311A,0000)
FALCOM A2D-GPS brQSPp3u5z501 V1.56 - 28.01.2002 (c)
2001 FALCOM GmbH
OK
```

## 14.14 Configuration the ignition line *&CNF IGN*

The ignition line on the connector power supply of the modem is to switch the modem OFF and ON, especially in the motor vehicle operation.
The user can ignore the ignition line by the command **&CNF IGN,-1**.
By the command **&CNF IGN,0** the modem switches OFF immediately when the ignition line is disconnected. The user can define the time for switching Off the modem after disconnecting the ignition line by the command
**&CNF IGN,Interval** (Interval: 1..60 minutes).

The ignition is supported as following (see table):

| Name | &CNF IGN,-1 (ignition ignored) | &CNF IGN,0 (immediately OFF) | &CNF IGN,1..60 (1 to 60 minutes) |
|---|---|---|---|
| **A2D-3** | Yes | No | No |
| **A2D-3JP3** | Yes | Yes | Yes |
| **A3D** | Yes | Yes | Yes |

Example 16: &CNF IGN

**Input:** `&CNF IGN,-1 //Ignition ignored`
**Output:** OK
**Input:** `&CNF IGN,0 //Switch off the device immediately`
**Output:** OK
**Input:** `&CNF IGN,5 //Switch off the device after 5 minutes of disconnecting the ignition line`
**Output:** OK